Poverty and Hospital Admissions in Christchurch 1988 - 1998

A thesis submitted in partial fulfilment of the requirements for the Degree of Master of Science in Geography at the University of Canterbury

by

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"The worlds most ruthless killer and the greatest cause of suffering on earth in listed in ....WHO's International Classification of Diseases, an A to Z of all ailments known to medical science, under the code Z59.5. It stands for extreme poverty"

Dr Hiroshi Nakajima, Director-General
World Health Organisation
The World Health Report 1995

Abstract

Good health is not evenly shared by New Zealanders. Numerous studies have shown that different sectors of the New Zealand population have different health outcomes. For example, Maori have higher mortality and morbidity rates than non-Maori (Pomare 1995, Durie 1985). For much of this century the way to improve the health of the population was believed to lie in improving public health, hygiene and sanitation, extending the scope, availability and access to medical care, and continuing the advances in medical knowledge and technology which characterised the achievements of the previous century. Such achievements were documented as lower occurences of epidemic and infectious diseases, falling death rates and improvement in life expectancy. Recent literature, both in New Zealand and overseas, conclude that socio-economic status is one of the most important health determinants. Further still, the literature tells us that hospital admissions are related to an individuals socio-economic status. Were the literature falls short is in documenting the *changes* in patterns of hospital admissions through the last 15 years – a time of major political upheaval and economic restructuring. Thus using Christchurch as a case study, this thesis examines in detail the link between deprivation and changes in the pattern of hospital admissions throughout the 1990's.

We found that the NZDep deprivation dataset is an excellent proxy for health status in most instances. We also found that admissions had increased, especially in the lower socio-economic groups. More importantly, the socio-economic gradient had increased leading us to conclude that the increase in deprivation has been reflected by a increase in hospital admissions.

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Without the cheerful and efficient Map Library staff, Janet and Sue, I would still be wading through endless journals and articles trying to find the 'right' one. Promise I will return those overdue books and maps.....Thanks to the computer techies, John, Steve, Graham and the long departed James. Especially John who had to put up with my endless question and (mostly) hairbrained ideas and my hogging of GEOG NT1. One of these days I just might remove all my files from the server. Long live the Macintosh!

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CHAPTER ONE

INTRODUCTION

1 Introduction

Should the geographic distribution of population matter? Why, because an individual lives in one area, are they more likely to become sick, be admitted to hospital, or die sooner, than someone living in another area? Inequalities in health are undesirable, because they are unfair, and therefore reducing these inequalities in an important goal for societies, regardless of the health or social benefits that follow (Woodward 1998).

Good health is not evenly shared by New Zealanders. Numerous studies have shown that different sectors of the New Zealand population have different health outcomes. For example, Maori have higher mortality and morbidity rates than non-Maori (Pomare 1995, Durie 1985). For much of this century the way to improve the health of the population was believed to lie in improving public health, hygiene and sanitation, extending the scope, availability and access to medical care, and continuing the advances in medical knowledge and technology which characterised the achievements of the previous century. Such achievements were documented as lower occurences of epidemic and infectious diseases, falling death rates and improvement in life expectancy. Future improvements in health are going to depend on a much more different set of factors that have moulded the improved health outcomes of the 19th and 20th centuries. The adoption of a healthier lifestyle factors (such as diet, smoking and alcohol, physical activity and sexual behavior) and the avoidance of health-risk behaviour are two areas in which there is a growing awareness.

But what about factors that are beyond the individuals control? The causes of poor health are complex. Age, sex and hereditary factors can have some effect on a individuals health status, but are beyond an individuals control. Demographic trends also effect a populations health. Predicted demographic trends, such as the increase in one-parent families and ageing population can influence the nature of the social and political environment and the health status of the population. Affordable and appropriate health and disability support services are also important, particularly in the treatment of established disease. Global factors also effect the health status of a population. Influences of historical events such as world wars and depressions are two

such examples. The globalisation of trade and the global environmental change can also have an effect on a population's health status.

Many social, cultural and economic factors effect health. Income is arguably the single most important determinant of health. With few exceptions the financially worst-off experience the highest rates of illness and death. Adequate income is also a prerequisite for many other determinants of health such as adequate housing, a nutritious diet and educational opportunities. Poverty has long been recognised as another important determinant of ill health, as has income distribution and income inequality. Employment, occupation and education is critical in determining peoples social and economic position and thus their health.

The first evidence of socio-economic inequalities in health was found in Britain's earliest mortality records, with 19th century researchers documenting the existence of a strong inverse relationship between occupational class and mortality (Williams 1990). Marked 'class gradients' in health measures have persisted in Britain, and the rest of the developed world, throughout the twentieth century, despite drastic improvements in medicine, nutrition, housing, water and sewerage systems (Davis *et al.* 1996). In 1980, Britain's Working Group on Inequalities in Health published the now famous Black Report, which showed that class gradients had in fact steepened in the 30 year period since the establishment of the National Health Service (Townsend and Davidson 1992). International evidence has steadily accumulated in the wake of the Black Report's publication, with relationships between measures of socio-economic status and health being documented throughout Europe, in the United States, Japan, Canada, Australia, New Zealand and several third world countries (Williams 1990).

Spatial analysis of health data has increased in popularity over the last two decades. International research has shown that there is frequently a strong relationship between locality and the health status of population. This is due to the association of socioeconomic factors with locality (Carstairs and Morris 1989). However, this association may also arise from physical and psycho-social factors that are associated directly with place (Moon 1995, Macintyre *et al.* 1993). There has been an increased

understanding of how environmental hazards may affect surrounding populations. There is also increased public concern about the hazard posed by pollutants from industry, toxic waste, and such possible hazards as electromagnetic radiation. In some cases community groups have become increasingly active in articulating their concerns about local heath issues.

1.1 Deprivation and the use of health services

The question of access to health care is of considerable importance to medical geographers, particularly as relatively poor access to medical care tends to correlate strongly with other indicators of social disadvantage such as sub-standard housing, high rates of population turnover, and criminality (Knox 1982). Hospital utilisation is related to many factors including demography, morbidity, medical resources, access, selection for care and physician practice patterns as are the characteristics of the population which will influence the type and number of admissions to a particular hospital. For example age, gender, economic status and ethnicity of the population can have an enormous effect on hospital admissions. A society's understanding of the determinants of health has an important influence on the strategies it uses to maintain and improve the health of its population (Mustard 1996). The measurement of deprivation and its relationship between socio-economic status is becoming increasingly important for a variety of reasons:

- Measures are required if primary care and public health interventions are to be effectively targeted to areas of highest need. Such targeting may result from formal needs assessments carried out by the Health Funding Authority, or more focused local needs assessments carried out by primary care and public health services.
- With a trend towards capitation funding of general practice, there is an increasing need for accurate, cheap and validated measures of deprivation or socioeconomic status to characterise registered practice populations.
- There is a powerful research imperative to investigate and monitor trends (e.g. avoidable mortality) in different socioeconomic groups to inform policy and other responses.

(adapted from Crampton *et al.* 1998)

Health policymakers are taking a more visible interest in the fundamental determinants of health status, and need cheap and effective ways of measuring deprivation and socioeconomic status. Dutton and Levine (1989) have observed that essentially the same socio-economic patterning of health outcomes is obtained in empirical research regardless of the socio-economic indicator used. Thus in the case of health research, it does not matter whether socio-economic status is measured by income, education, or occupation, the same picture emerges: those at the bottom generally have the highest rates of death and disease.

The measure of deprivation provides one of the main bases for analysis in this thesis. Townsend (1987) defines deprivation as "a state of observable and demonstrable disadvantage relative to the local community or the wider society or nation to which an individual, family or group belongs". Deprivation levels are commonly valued on an index scale based on the measurement and comparison of characteristics such as basic physical, cultural and higher needs. These datasets are useful as they provide a better feeling for the causes of poverty in the region as opposed to using simple monetary indicators, which may miss the important social aspects of poverty and deprivation. Deprivation can also be used as a proxy for socio-economic status.

1.2 Relating health and deprivation in a New Zealand context

Economic restructuring undertaken in the last 15 years within New Zealand has seen many people become marginalised, with poverty and heightened social inequality becoming important political issues (Barnett and Coyle 1998). A number of structural factors related to the reform of the welfare state has had far reaching consequences, especially for lower income groups. Welfare cuts, and reductions in the level of income support and housing assistance from the state, has resulted in increased deprivation and a dramatic reduction of disposable income for many people (Brown and Salmond 1997).

The literature tells us that individuals from the lower socio-economic classes are more likely to be admitted to hospital. Those New Zealanders who are unable to afford private health insurance are having to wait for treatment, often with a consequent

deterioration in their health and an associated financial and social burden. In a comprehensive study of the North Health region by Jackson *et al.* (1998) it had been estimated that if avoidable hospitalisation rates (that is conditions that are normally easily treated with primary health care) of individuals in the lowest socio-economic groups were reduced to that of the middle groups, then around 950 admissions per year might have been averted. This represents around $2.2m per annum, based on average hospital costs. If all groups had the same rate as individuals in the highest socio-economic groups, then about 2,900 admissions per year might have been saved, representing around $6.8 m in hospital costs alone.

Reports on the growing inequality within the health sector have prompted agencies to investigate further (see for example Jackson *et al.* 1998, Howden-Chapman *et al.* 1998, National Health Committee 1998). The issue of health inequality is also becoming more politicised, as it effects a greater percentage of the population. In the run up to general elections, political parties are identifying health equality issues as a major policy platforms. Alliance's health policy, for example, will make all doctors visits and prescriptions free and reduce waiting lists to 'acceptable' limits (Bunkell 1999). In contrast, ACT will implement a voucher system that will allow individuals apply to a comprehensive scheme of their choice. Shirley (1999) believes this will reduce health inequality by allowing the individuals to select the health provider that best reflects their needs.

Political rhetoric aside, it is clear that there is growing inequality in health sector. There have been a variety of research published in New Zealand, examining the relationship between socio-economic status and hospital admissions (see for example Jackson 1999, Jackson *et al.* 1998, Hoskins 1990, Pierce 1983). The large majority of these studies have documented a socio-economic gradient in hospital admissions. As has been seen in the United States, United Kingdom and other developed countries, individuals from the lower socio-economic classes are more likely to be admitted to hospital. Were the literature falls short is in documenting the *changes* in patterns of hospital admissions through the last 15 years – a time of major political upheaval and economic restructuring. Thus using Christchurch as a case study, this thesis intends to examine in detail the link between deprivation and changes in the pattern of hospital

admissions throughout the 1990's. In particular, has the increase in deprivation been reflected by a increase in hospital admissions?

1.3 Specific Research Objectives

This thesis has two main objectives.

Firstly the thesis attempts to understand and identify the current patterns and processes in health and deprivation, both in a New Zealand context and at an international scale.

Secondly, the thesis aims to determine the extent to which neighborhood socio-economic status (i.e. deprivation indices) can predict variations in hospital admissions.

1.4 Thesis Structure

This thesis comprises seven chapters. Following the introduction in Chapter One, Chapter Two and Three will address the first objective of the thesis and establish the theoretical basis of the research. In Chapter Two, the general theories of health and deprivation, and the main ideologies that dominate this type of research will be discussed. Chapter Three explores historical and current research into patterns and processes in hospital admissions and deprivation, both in New Zealand and the international arena.

Chapters Four, Five and Six address the second objective of the thesis – namely examining the extent to which hospital admissions can be predicted by variations in neighborhood socio-economic status. Specifically Chapter Four outlines the methodology used in analysing hospital admission and deprivation data. Chapter Five explores the broad trends of admissions over the 1988–1998 period into Christchurch Hospital, and focuses on the changes in admissions by socio-economic group. Chapter Six examines admissions from 1991 and 1996 and discuses the change in patterns. Selected conditions are also examined.

Chapter Seven summarises the main conclusions of this research and discusses the practical and theoretical implications.

CHAPTER TWO

DEPRIVATION, HEALTH AND THE USE OF HOSPITAL SERVICES

2 Introduction

Chapter Two has three purposes. First, it introduces the reader to the theories of health, deprivation, (in)equality and poverty as well as the main ideologies that dominate this type of research and their inter-relationship. Second, the links between health and deprivation are discussed. Although most of the research has focused on social class, attention will be paid to other forms of inequalities, including gender and ethnicity. Finally, an examination is made of deprivation and the utilisation of health services, with the focus being on access to tertiary care.

2.1 Health

There is no simple or obvious way in which "health" can be defined. This first section examines the premise of health – how we have tried to define, measure and determine it.

2.1.1 Defining health?

Defining health can be dependent on the historical period in question, and rising expectations have changed the definition. Western cultures expect their health not to be merely adequate, but good, if not excellent. A condition that is a norm in one society, can be a disease in another. Age and gender can be another factor in determining who is sick and who is not. As the elderly experience more sickness, pain and discomfort might be at a lower threshold than for a younger person. Definitions of health can also reflect the ideology and culture of the most powerful groups in society. In modern societies, there is a tendency to include more conditions of disease, such as alcoholism and drug dependence. There is also more tolerance of the diseased person. Larson (1991) attributes this acceptance as a reflection of the expansion of national health insurance and the consequent expansion of the definition of disease.

Disease or physiological status can be identified or measured, but many would argue that health and illness are social as well as biological facts. Lay people, as demonstrated in self-reported national surveys of health, both in the United Kingdom

(see Blaxter 1990) and New Zealand (see Statistics New Zealand 1993), define health as a far wider, all encompassing social wellbeing, as well as biological facts. However, as many historians and critics have pointed out, the definition and classification of disease is inevitably to some extent socially constructed and the normality itself is a relative and judgmental concept (Blaxter 1990, Mishler 1981). Larson (1991) notes that there are five general approaches to defining health – the medical model, holistic model, the wellness model, the environmental model and the eclectic model. The medical model is primarily founded on defining health as the absence of disease or illness, while the holistic model encompasses the whole person, including physical, mental and social health. The wellness model is concerned with "better that normal" states, as well as subjective feelings of health. The environmental model describes optimal interaction with the environment, and the eclectic model includes the unusual definitions of health.

Another definition of health is the *coping theory* where health is essentially an ability to adapt to the problems that life gives us. Under this definition individuals can be healthy even if they are diseased or ill so long as they have the personal strength and resilience to cope with life. A person without disease or illness can be unhealthy if they are unable to cope. A further definition of health, is that of the World Health Organisation (WHO), who define it as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO 1947). This definition has been widely criticised, in part because if taken literally, it can mean that individuals are unhealthy if they are unhappy. Taken in another context, it can also mean that anybody with a disease, illness or disability cannot be healthy. It has been suggested by Blaxter and Paterson (1982) that a definition of health as 'not-ill' is characteristic of people in poorer circumstances, and to lack a positive view of health is a mark of general social deprivation.

One problem with these definitions is their failure to explicitly bring in the social and cultural dimensions of health and ill health. A later definition of health from the World Health Organisation describes health as the '"the extent to which an individual or group is able, on the one hand, to realise aspirations and satisfy needs and on the other hand, to change or cope with their environment. Health is therefore seen as a

resource for everyday life, not the objective of living: it is a positive concept emphasizing social and personal resources as well as physical capacities" (WHO 1984 cited in Whitehead 1992).

These broad definitions of health are not new. The classical Platonic model of health has harmony among the body's processes and the Galenian concept of disease as disturbance of equilibrium. Trying to operationalise such a wide concept of health has the danger of embracing all human life and happiness under one 'umbrella'. It can be argued though, that it does draw attention to the fact that the positive aspects of health should be considered, just as much as the negative aspects of pathology. Brown (1991) contends that the problem lies more in the fact that we know much less about the things that favour positive health than those which cause disease.

2.1.2 Measuring and determining health

Once we have determined how health is defined we need to identify the way in which we measure it. This is not an easy task, especially as we have argued above, there is no clear and concise definition of health itself. The more common or traditional measures of health include:

- life expectancy
- major causes of death
- infant mortality
- morbidity

These statistics of mortality (death) and morbidity (injury) provide objective measures of the health status of the population. Life expectancy is one of the most useful summary measures of overall health. It shows how much longer, on average, a person at a given age can expect to live if present patterns of mortality did not change during her or his lifetime. A more detailed picture of death can be drawn from age-specific mortality rates and causes of death. Major causes of death can indicate a trend for a given group of people. For example, motor vehicle crashes make up nearly half of all deaths in the male 15 – 24 age group. Ischaemic heart disease (coronary heart

disease), cancer and cerbrovascular disease (strokes) account for up to 63% of all deaths in New Zealand (Department of Statistics 1993). Infant mortality rates are recognised as being a sensitive indicator of social and economic conditions and is often used to make international comparisons, especially in less developed countries.

Statistics on morbidity provide another view of the health of a population. Compared to mortality statistics, which provide a useful indication of longer-term changes in health status, morbidity statistics provide a more immediate view of a country's health. They are therefore more useful in assessing the effects of current efforts to improve levels of health. Hospital discharge records provide the only regular national data on the prevalence of illness in the population. As proxy indicators of health status they suffer from deficiencies in coverage, particularly of less serious illness, and more importantly, the illness suffered by people who do not have adequate access to health services. The also may be exaggerated as a result of supply induced demand and Roemer's Law (discussed further in section 2.3.2). Thus the rate of hospital admissions cannot be seen as a simple indicator of the health (or ill-health) of a population. Other sources of information need to be employed, such as health surveys, or attendance at hospital out-patient, day-patient clinics and general practitioners.

Another means of measuring health statuses is to ask people for a self assessment of their health. While introducing and element of subjectivity into the definition of illness, this form of measurement has some distinct advantages over using more objective measures such as morbidity and mortality rates. One of the main advantages is that it is more directly concerned with well being than with actual sickness and has been found to correlate closely with health outcomes (Department of Statistics 1989). Self-assessed health can also show a clear association with educational attainment, income and labour force attainment (Statistics New Zealand 1993).

One illusion is that medical care is synonymous with health care and that, as a result, medicine alone can lead to better health. Although advances in medical science and practice have been important to human health and wellbeing, evidence indicates that behavioral, psychosocial, and environmental factors are the major determinants of health. Studies have shown that improved nutrition and better living conditions are the

critical factors that have improved health in human populations (House 1997). Blank (1997:59) contends that the "interactive model of health requires a shift away from the dominance of the medical care system toward this more inclusive model of health". Hurowitz (1993) concurs and argues that social problems are resolved primarily through non-medical means.

It can be argued that many of the underlying socio-economic causes of health inequalities are amenable to changes in public policy. The health care system has been defined largely as a 'disease' care system (Blank 1997). A significant proportion of medical costs in New Zealand are directed towards dealing with the products of poverty, crime, drug and alcohol abuse. There is, however, substantial evidence that health outcomes of populations are more highly correlated with the economic and social environment than how much is spent on medical care. Moreover, there is evidence that core social problems cannot be resolved by medicine. The assumption that there is a medical solution to every health problem and that there is a technological fix to longstanding social problems is misleading. It can be (strongly) argued that instead of spending more on medicine we must seriously consider shifting resources from medical care to programs designed to reduce poverty, unemployment, crime and other social ills that are linked to health.

The literature has shown that the more we increase our understanding of the determinants of health, the more escapable is that a person's health cannot be divorced from the social and economic environment in which we live and work. Benzeval *et al.* (1993) outlines several factors which are increasingly recognised to be of critical importance:

- The physical environment, such as adequacy of housing, working conditions and air pollution
- Social and economic influences such as income and wealth, levels of unemployment, the quality of the social environment and social support
- Behavioral factors and barriers to adopting a healthier personal lifestyle
- Access to appropriate and effective health and social services

Blaxter (1990) suggest that not only socio-economic circumstances and the external environment, but also the individuals psychosocial environment is more important as a determinant of health, than healthy or unhealthy behaviors. Whitehead (1992) also argues that general living conditions and the environment of the poor are important determinants of health status. Davis *et al.* (1999) propose an integrated model of the social and economic determinants of health. This model is based on broad structural features of society – social, economic, and environmental – that have a broad impact on the health of populations. This is illustrated in Figure 2.1.

2.2 Examining linkages between health and inequality, poverty and deprivation

The terms, inequality, poverty and deprivation are widely used – not always accurately – and can be broadly interpreted. Each term can overlap at some stage with each other and can be open to broad and variable interpretation. This section discusses these terms, examines the linkages with health, and discusses health variability.

2.2.1 Inequality

Inequality is concerned with some people having less than others, and others being either the average or the comparatively rich. The reference point is other members of the same society (Berthoud 1976). There is nothing new or unique about the existence of inequalities in health. They were first documented by Farr in Britain in the 1860's, and are evident in most countries around the world. Growing disparities in health are not inevitable. Economic inequalities, which many would argue are the main driver of health inequalities, are the outcome of deliberate social decisions such as tax policy, regulation of business and labour, welfare benefits and health care funding. Greater equity in health is achievable through the provision of better opportunities for good health, including investment in human capital, redistributive polices and secure access to health care. It is argued by Glyn and Miliband (1994) that health in Western societies is now influenced less by people's absolute standard of living than by their standard relative to others in society. Once the vast majority of the population is above some basic level of subsistence, then increasing standards of material comfort

make less and less difference to health outcomes. What can affect health most is the distribution of resources within each society.

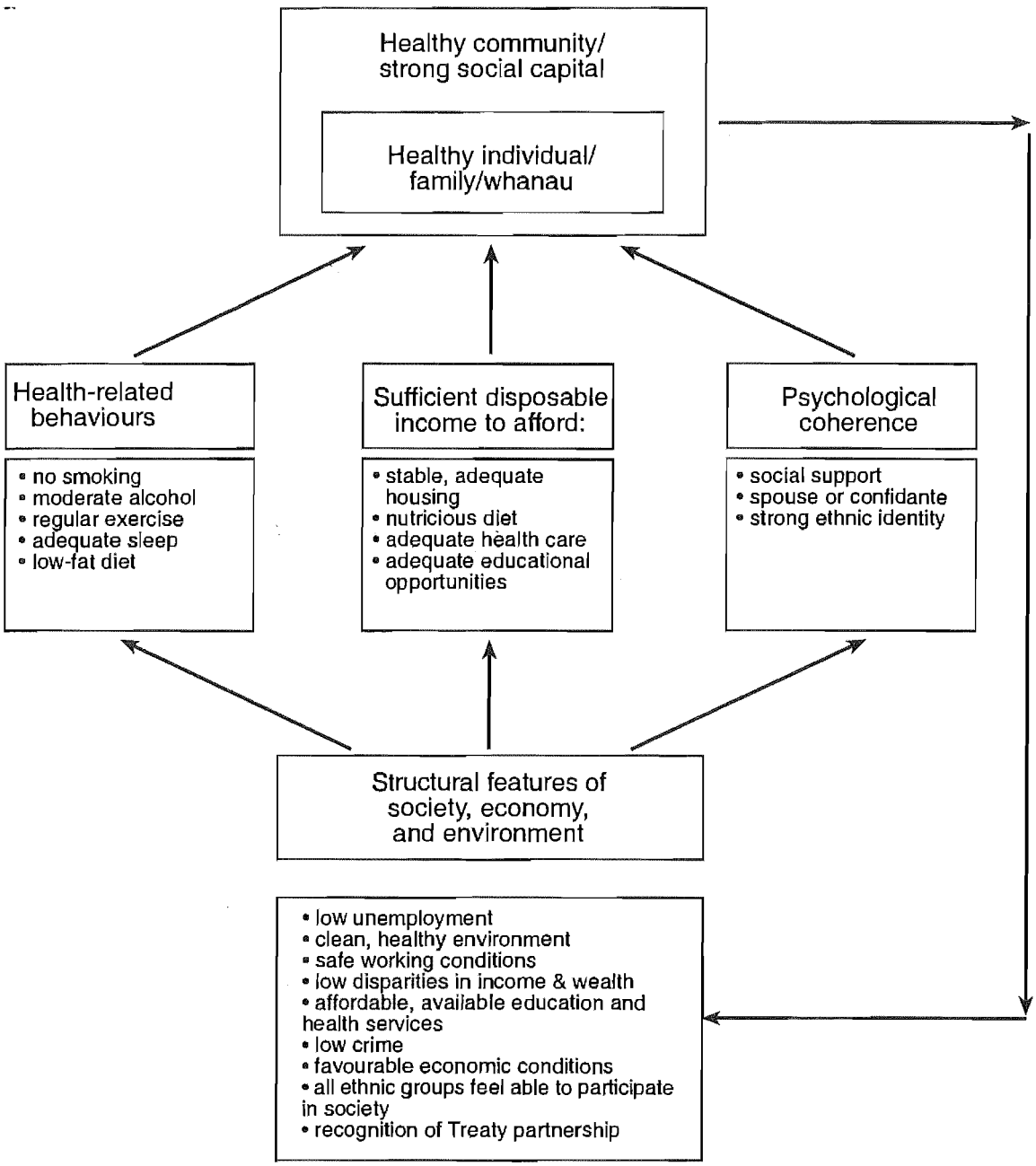


Figure 2.1: Integrated model of the social and economic determinants of health

House (1997) argues that socioeconomic differentials are arguably the most important public health problem facing the United States. While improving the inequalities of access to medical care in the United States would help make a significant difference,

social inequalities in health are not due primarily to a lack of health care. People of lower socio-economic status have a multitude of psychosocial risk factors that health care alone will not be able to overcome including smoking, lack of exercise, immoderate eating and drinking, and high fat/low fibre diets. House concludes by arguing that to have a substantial impact on public health in the United States there would need to be a decrease, both in absolute and relative deprivation and inequality of the lower 30 to 50 percent of the socioeconomic distribution.

Those dealing with *inequality* consider the gradient in health over the whole population through the various grades, while those focusing on *deprivation* single out the most disadvantaged subgroups, whose welfare falls below a reasonable minimum standard. It is important to note that each may have different policy implications. Policies related to deprivation may be targeted exclusively to the worst off, while policies to reduce inequalities may be wide-ranging and encompass changes at all levels of society (Whitehead 1992).

Across the developed world, no matter how social status is measured, those in the most disadvantaged circumstances suffer worse health than all of those above them, especially those who are most advantaged. Where statistics have been available over a long period of years, there is no evidence that general improvement in health has been accompanied by a reduction in variations between social classes.

Explanations about the causes of inequalities in health are complex, but is likely that a combination of factors is at work reflecting people's living and working conditions, their resources, social relationships and lifestyles. It can be argued that since much health related behaviour itself is socially determined, it is peoples circumstances that are the most important determinant of health (Benzeval *et al.* 1993).

> It is widely accepted that there are natural differences in health in the population – human beings vary in health as they do in every other aspect of life. Deciding what is fair and just is a subjective judgement. A recent World Health Organisation (WHO) discussion paper outlines inequality:

> In health terms, 'ideally everyone should have a fair opportunity to attain their full health potential, and, more pragmatically, none should be disadvantaged from achieving this potential if it can be avoided'. In health care, the principle of equity 'leads to equal access to available care for equal need, equal utilisation for equal need and equal quality of care for all.'
>
> Whitehead (1992 :222)

2.2.2 Theoretical approaches to inequality

Health status disparities linked to social class are most likely the result of a complicated mix of factors suggested by three or four distinct theories (Blank 1997 and Townsend and Davidson 1992). These are:

- Theories of natural or social selection
- Materialist or structuralist explanations
- Cultural and /or behavioural explanations
- Artefact approach

The theories of natural or social selection contend that one of the key determinants of social class is health status, and that persons with poor health, high-risk behaviour, and social pathologies are concentrated in the lower classes or socio-economic status. Thus class or socio-economic status becomes the dependent variable. It is hypothesised that the higher social or socio-economic classes has the lowest rate of premature mortality because it is made up of the strongest and most robust individuals in the population. By contrast, the lower end of the social scale contains the weakest and most frail people. Thus this explanation suggests that physical weakness or poor health carries low social worth and plays an important part in the event of high mortality. Townsend and Davidson (1992) suggest that these selective processes are thought to occur even though the extent may not be so great and there is little actual evidence of it. Blank (1997) contends that although this might explain the disparity at the margins, it is not generally seen as a major explanation.

Materialist or structuralist theory attributes class differences in health to structural factors such as the production and consumption of wealth. There are several separate

threads which can be ordered more or less to the extent in how they directly or indirectly influence economic deprivation (Townsend and Davidson 1992). The radical Marxian critique can arguably be viewed as the process in which poverty or economic deprivation has a direct influence in variation of mortality rates. Two other related theoretical approaches are concerned with the effect of macro-economic variables – levels of production, unemployment on health. One approach concerns the fluctuations in mortality data and its link to recessions and wide-scale economic distress. Another approach is concerned with disproving the common assumption that economic growth leads to an increase in general level of health.

Cultural and behavioral theory sees disparities in health among social classes as the results of difference in behaviour. It is argued that often the culture of the lower classes leads to engagement in many high-risk behaviors that in turn, lead to poor health. Smoking, alcohol and drug abuse, violence, poor diet and other unhealthy behaviors are disproportionately present in lower socio-economic classes. Townsend and Davidson (1992) define the 'Culture of poverty' theory as a process of biological and social adaptation which gives rise to the elaboration of a structure of norms, ideas and behaviours has been widely criticised by British social scientists. The artefact approach suggests that both health and class are artificial variables thrown up by "...attempts to measure social phenomena and that relationship between them may itself be an artefact of little causal significance" (Townsend and Davidson 1992:105).

2.2.3 Examining poverty

Townsend (1987) makes a distinction between poverty and deprivation. Poverty, he concludes, is a concept relating to levels of income and access to other available resources, while deprivation deals with the level of conditions or activities experienced. The exclusion from participation in society is a common theme between poverty and deprivation. It can be argued that the two concepts are separate but equally important (Townsend 1987). Another difference between poverty and deprivation is that poverty is usually measured using income, while deprivation is measured using composite measurements like unemployment, mortality or crime. Deprivation has become a surrogate for poverty given the lack of suitable sources of

data. This thesis uses deprivation in a similar vain – as a complete deprivation dataset is available (see Chapter Four) for New Zealand.

The traditional definitions or understandings of poverty has tended to focus mainly on financial factors. Townsend (1987:47) defines poverty as "the ability to meet needs as proscribed by society, the cultural groups and the specific family to which one belongs". He continues by admitting that it would be difficult, if not impossible, to apply the definition. George and Howard (1991) outline four broad definitions of poverty – starvation, subsistence, social coping and social participation. Any definition of poverty can be highly subjective and value laden – at which point do we create a poverty threshold? Jamieson's (1998) definition of poverty encompasses three overlapping dimensions, which are related through a complex set of interactions:

- Material and/or financial
- Spiritual / isolatory (a poverty of spirit)
- Participatory

Material poverty is an inability to provide material necessities. Put simply, this focuses on a lack of money and income; an issue that is usually the most immediate need of people on limited incomes. This dimension also involves an examination of the cost and affordability of basic necessities (such as accommodation and food) and the impact of cost on peoples' abilities to provide for themselves and significant others. Spiritual poverty can be defined as an isolation from other members of the community. This involves factors such as fractured and dysfunctional relationships, emotional strain, limited happiness, feelings of being an undervalued and non-contributing member of the community; and a lack of a sense of belonging. Participatory poverty is an inability to participate in community life and most things of interest to a level that is meaningful for the individual. This incorporates limitations on participation in terms of accessibility, affordability (material / financial) and appropriateness. It also involves a lack of real and perceived choice in decision making. An inability to make provision for non-financial needs such as support, welfare and well being could also be included. Poverty and hardship occur when an

individual's life circumstances prevent them from participating to varying degrees in community life. As such, poverty is seen in relative terms, that is, by assessing an individual's situation relative to other members of the community, rather than examining it in absolute terms. (Townsend 1987, Easton 1986 and Ringen 1988).

2.2.4 Defining and measuring deprivation

The measure of deprivation provides one of the main bases for analysis in this thesis. Townsend (1987:32) defines deprivation as "a state of observable and demonstrable disadvantage relative to the local community or the wider society or nation to which an individual, family or group belongs". Brown and Madge (1982) expand the definition and argue that deprivation is the perception of the majority:

> Deprivations are loosely regarded as unsatisfactory and undesirable circumstances, whether material, emotional, physical or behavioural, as recognised by a fair degree of societal consensus. Deprivations involve a lack of something generally held to be desirable – an adequate income, good health etc. – a lack which is associated to a greater or lesser extent with some degree of suffering.....(p..39)

An even broader definition by Berthoud (1976) defines deprivation as all the various misfortunes people can suffer in society.

An historical perspective of deprivation could be defined as a "phenomenon that has risen in the field of political thought" (Berthoud 1976:175). This could be a view of the way society works, in relation to how it should work, as much as the phenomenon existing in society itself. Two hundred years of industrial prosperity and public concern for the welfare of the 'masses' has led to a new emphasis on the need to ensure the welfare of minorities. We are finding now, that poverty of the poor is becoming more unacceptable to society as a whole.

Deprivation takes many different forms in every known society. People can be said to be deprived if they lack the types of diet, clothing, housing, working and social conditions, activities and facilities which are customary, or at least widely encouraged, in the society to which they belong (Townsend 1979). A person may not lack material goods, yet they may be considered deprived if they feel excluded from

society. Another form of deprivation, which is more readily adopted in Third World countries, is categorised as what the standard of living could be for the majority, given a better redistribution of resources or a reorganisation of institutions in that society (Townsend 1987). Thus defining deprivation as a single concept is nigh impossible. Starting from a list of social misfortunes, such as unemployment, poor health and education, there can be seen a whole range of problems that are not necessarily suffered in combination by the same people. Similarly, taking any one problem, we can list different types or groups of people who suffer – the elderly, solo mothers, large families etc. This can suggest an "unconnected maze of traps into which people or families may fall for a variety of reasons" (Berthoud 1976:176). Experience does suggest that that we can describe some very broad groups of people for whom deprivations of every sort are very much a probability. For example, as a class of people, the elderly have more than their share of social problems.

Deprivation is a problem that most commonly afflict people in the lower strata of society. But they are not exclusive to the very lowest stratum; the middle class are also affected, and even, occasionally the higher classes. Multiple deprivation, is probably even more concentrated in the lower classes. In contrast, some members of the lower classes may suffer none of the problems we consider to be deprivations. Although inequality also largely effects the lower socio-economic classes the connection between the two is that general inequality is found to imply an unequal risk of deprivation.

The concept of deprivation is used extensively not only in the analysis of social conditions but also in an applied form as an instrument of policy in allocating resources to particular regions, areas and services. It can be argued, of course, especially as this thesis is looking at people at all points of the spectrum, from extreme prosperity to extreme disadvantage, that the term 'deprivation' is somewhat of a misnomer. It is however a convenient description for what would otherwise require a more complex label. In recent years, the term 'deprivation' has been used widely in the literature, and thus, this thesis follows the tradition. Critics of deprivation measures have also attacked their composition referring to the limited menu of variables available on the census, and the arbitrary basis for the selection of

variables. The use to which measures are to be put may also have some impact on their composition. The use of a number of deprivation measures in the United Kingdom, United States and New Zealand have added weight to there continued use as a measure of a populations' social status. A complete examination of several of these measures is made in the proceeding chapter.

One form of deprivation – Health – is the major focus of this thesis. There are many difficulties inherent in ill health and disablement; there are the social problems inflicted both on the patient and family/friends; there are financial problems resulting both from partial and total earning power, and from increased outlay. In these senses, people suffering from ill health are undoubtedly 'deprived'.

2.2.5 Measuring socio-economic status

Measures of income tend to display strong relationships with social indicators. Several researchers have observed that income is in fact a better predictor of health status than any other SES indicator. In his comparison of educational, occupational and income-based socio-economic status indicators Hay (1988) found the latter to exhibit the most consistent relationship with health status. And Krieger and Fee (1994) found income-related inequalities in health to be more pronounced than health inequalities associated with education. Unfortunately the opportunity for examining the association between health and income has been restricted by lack of information and the complex role played by material factors in creating the patterns and processes of ill health (Townsend and Davidson 1992).

Increasingly, researchers seem to be advocating education as the most reliable measure of socioeconomic status (Williams 1990). Krieger and Fee (1994) argue that the advantage of education-based measures over other socio-economic indicators lies in their stability - as educational attainment levels are typically established at an early age and tend to remain stable over the course of individuals' lives, any relationship observed between health status and level of education is unlikely to reflect the operation of social selection. However, using educational indicators of socioeconomic status are not without their problems. Najman (1988) contends that the measurement

of education levels is complicated by the incommensurability of different kinds of education. To give an example, one might reasonably ask what basis for comparison exists between a post-secondary school qualification gained in the course of on-the-job training, and a University degree received within the same time-frame. Another problem is the growth in higher education in contemporary societies, as it presents an obstacle for researchers seeking to compare the socioeconomic health inequalities documented for different age cohorts (Blaxter 1990). Similarly, the cultural specificity of educational standards complicates attempts to undertake internationally comparative research in the field (Blaxter 1990).

Measures of occupation have been shown to correlate highly with other socio-economic indicators which are often more difficult to acquire (Elley and Irving 1976). Occupation-based socio-economic status indicators have been particularly favoured by health researchers in Britain, where the conventional method for measuring socio-economic inequalities in health status has historically involved the examination of male mortality rates by occupational class (Macran *et al.* 1994). Problems have arisen though, as the available occupational data may be of poor quality. The authors of a recent study on socioeconomic mortality differences for instance found the occupational information recorded on women's death certificates to be particularly inadequate (Pearce *et al.* 1991). Since less than half of the women in their initial sample could be allocated an occupational class on the basis of the information recorded on their death certificates, Pearce *et al.* were unable to include women in the study. More crucially, the utility of occupational socio-economic indicators is undermined by their lack of applicability to individuals with no direct, current attachment to the labour market, such as housewives, beneficiaries and the retired. Such 'economically inactive' persons are certainly not exempt from processes of socioeconomic stratification (Davis *et al.* 1996).

Local area measures of socioeconomic status involve allocating individuals a score or indice on the basis of their dwelling area, which, in turn, is classified according to the socioeconomic characteristics of its population as recorded in the last census (Macintyre *et al.* 1993). Such measures function as useful surrogate indicators of socioeconomic status when individual-based indicators are not available for sample

populations (Marmot *et al.* 1995). The greatest advantage of area-based measures lies in their wide applicability, as they enable the allocation of socioeconomic status scores to all individuals, regardless of age or employment status (Krieger and Fee 1994). Several recent area-based socioeconomic indices seek to measure 'deprivation', as distinct from socioeconomic status. Such 'material deprivation indices' have been developed by Townsend *et al.* (1988), Carstairs and Morris (1989) and Crampton *et al.* (1996).

2.3 The geography of health inequalities

2.3.1 Health and its variability

The relationship between socio-economic status and health status has been well described in the literature, both internationally (see Blaxter 1987, Charlton *et al.* 1983 and Carstairs *et al.* 1991 for example) and in New Zealand (see Hoskins 1990, Crampton *et al.* 1998, Jackson *et al.* 1998, Pearce *et al.* 1983, Pearce *et al.* 1985 and Reinken *et al.* 1985 for example). Classifying society into various classes was first made popular in the 19th century by Charles Booth. The population of London was divided into eight classes for the purposes of identifying socio-economic status. In 1839 Gavin investigated 1632 deceased in a London suburb, and found that the average age of death of professional men was 45, whereas that of tradesman and their families was 26 years and that of labourers was 16 years (Pearce *et al.* 1983).

Marked 'class gradients' in health measures have persisted in Britain throughout the twentieth century, despite drastic improvements in medicine, nutrition, housing, water and sewerage systems, and the institution of a National Health Service (NHS) (Williams 1980). In 1980 Britain's Working Group on Inequalities in Health published the now famous Black Report, which showed that class gradients had in fact steepened in the 30 year period since the establishment of the NHS. The report attested to the continuing relevance of socioeconomic factors as powerful predictors of health status, and set the stage for a subsequent profusion of research into the relationship between socioeconomic status and health (Townsend *et al.* 1992). International evidence has steadily accumulated in the wake of the Black Report's

publication, with relationships between measures of socio-economic status and health being documented throughout Europe, in the United States, Japan, Canada, Australia, New Zealand and several third world countries (Williams 1990).

The relationship between socio-economic status and health typically takes the form of a curvilinear gradient, with increments in socio-economic status precipitating successively smaller gains in health status as one ascends the socioeconomic strata (Saunders 1996, Davis 1996). Numerous researchers have observed that socio-economic inequality in health is therefore not merely a case of a 'gap' in health status between rich and poor; rather, a continuous gradation of difference operates throughout the entire socioeconomic distribution (Ford *et al.* 1994, Marmot *et al.* 1995). Davis *et al.* (1996) suggest that the continuity of the gradient is *relative* rather than *absolute* socio-economic status that produces the class patterning of health data. Put another way, it would seem that socio-economic inequalities in health cannot be explained solely in terms of a 'threshold effect' of poverty (Ford *et al.* 1994: 1041). It must be noted that while most researchers have documented clear differences in health status between the highest and lowest socioeconomic deciles, evidence of a continuous class gradient operating throughout the strata is not always found (Saunders 1996).

2.3.2 Compositional effects in health status

Social and economic conditions are powerful determinants of the health status of individuals and populations. A significant part of these differences in morbidity and mortality can be accounted for by *compositional* effects, resulting from the aggregated attributes of individual people (Curtis and Taket 1996). Most of the early studies of socio-economic differences in health have had to rely solely on mortality data. However in recent years a number of rich national datasets have been made available that allow individuals' morbidity experiences to be linked to their social and economic circumstances (Fox and Beneval 1993). Why persons of low socio-economic status are vulnerable to virtually all psychosocial and environmental risk factors is not fully understood, although science has discovered much about how socioeconomic factors can get 'under the skin' (House 1997). These individuals also

experience more chronic and acute stress, higher rates of ill health and death among family and friends, lower levels of social support and personal efficacy, and higher levels of depression and hostility, and typically live and work in environments that are hazardous to health.

Although there is a wide variation in health status across nations, there is often an even wider variation between groups within particular nations which can not be explained by differences in the health system. Papas *et al.* (1993) found a strong inverse relationship between social class and mortality. Despite an overall decline in death rates in the United States since 1960, poor and poorly educated still die at a higher rate than those with higher incomes or better education, but more importantly this disparity increased between 1960 and 1986. Pearce (in Wilson 1996) has suggested that the particular components of socioeconomic status that are most relevant in affecting health have not been identified. That is, the relative roles of income, gender, education and lack of empowerment have not been clarified. Even the relative importance of socio-economic factors relative to ethnic and locality factors (including aspects of material deprivation) is poorly understood.

The socio-economic classifying of women's health been mentioned little in the literature (Arber 1989). Of the studies conducted in this area, they have revealed class gradients in measures of health for women which are much flatter than those observed for men (Arber 1989, Arber 1991). Arber (1991) contends that the application of generic socio-economic classification schemes to female populations may mask the true extent of socio-economic inequalities in health among women.

Ethnic minority status has been widely identified as an independent risk factor impacting on health outcomes (Kaplan 1989). In New Zealand, the health experience of Maori exemplifies what is broadly accepted as an international tendency in the relationship between ethnicity and health. Recent figures show that ethnic differentials hold for a wide range of health measures in New Zealand, including mortality, morbidity, health-related behaviours and the receipt of health services. Although the gap in life expectancy between Maori and non-Maori has narrowed over this century, Maori still face considerably higher risks of mortality at all ages, with

life expectancies being on average 5.1 years and 4 years shorter for Maori women and Maori men respectively, than for their non-Maori counterparts (Davis *et al.* 1996). There is disagreement on the relative importance of socioeconomic and ethnic factors in shaping health outcomes. Several researchers have documented the persistence of a substantial 'ethnic effect' on health outcomes even after socio-economic status has been taken into account. (Sundquist 1995, Andrews and Jewson 1993). New Zealand research has replicated similar patterns, thereby supporting the view that ethnic differences in health status cannot be reduced to socio-economic causes (Davis *et al.* 1996). In conclusion researchers cannot justifiably treat socioeconomic status in complete isolation from the structural factors of gender and ethnicity.

2.3.3 Contextual effects in health status

There is an extensive body of theory which support the argument that *contextual* health effects associated with place and space may contribute to health variation. Curtis and Jones (1998) identify three types of theoretical framework that support contextual effects; spatial patterning and diffusion of physical and biological risk factors; social relations; and sense of place. Spatial patterning in health variation can be due to such risk factors as environmental pollution, climate, risk of accidental injury or death, or housing equality. The psycho-social impacts of pollution, as well as the physical health outcomes, may depend on the community context and that the social construction of hazard may be significant to interpretation of the physical environmental risk (Curtis and Jones 1998). Social theory gives a variety of perspectives on the social relevance of health variation. These theories include structuration, geographies of consumption and lifestyle, and social control and territoriality. These theories suggest that health and health behaviour interact with various landscapes, and that these landscapes are often determined by the most influential and privileged groups in society. A humanist approach to contextual health effects emphases the notion of sense of place. Kearns (1991) notes that certain cultures imbue particular places which have special meaning from their point of view. In order to account for observations in health variation in Scotland Macintyre *et al.* (1992) proposes broad types of socio-environmental influences on health. This is depicted in Table 2.1.

Table 2.1: Influences of place on health

Physical environment
Availability of health/unhealthy environments
Services provided
Socio-cultural factors of neighborhood or locale
Representation of neighbourhood
Lay systems of beliefs and behaviours
Labour markets

Source: Macintyre *et al.* (1992)

2.4 Deprivation and the use of services

Health care, like many public services, is not equally available to all individuals. The question of access to health care is of considerable importance to medical geographers, particularly as relatively poor access to medical care tends to correlate strongly with other indicators of social disadvantage such as sub-standard housing, high rates of population turnover, and criminality (Knox 1982). This section examines the models of service use and places it in the context of deprivation and equality of use.

2.4.1 The influence of need and demand

Hospital utilisation is related to many factors including demography, morbidity, medical resources, access, selection for care and physician practice patterns. Two interrelating forces make up the greatest impact. The first is a *need* or *demand* based variation. These are the characteristics of the population which will influence the type and number of admissions to a particular hospital. For example age, gender, economic status and ethnicity of the population can have an enormous effect on hospital admissions. The second type of variation is referred to as *supply* based variations. Two major components make up the supply side variations – the action of the supplier and the influence that systems of health care have on delivery.

To define access, we first need to define between *locational* and *effective* accessibility. Locational access represents physical proximity between the service and the user. Effective access is far more wide arranging and addresses the issues of whether a facility is always available or open, whether it is socially or economically available to people, and whether a person's time-space budget permits (Joseph and Phillips 1984). The study of locational access to health care can be pursued in two broad ways (Joseph 1986). *Revealed accessibility* involves the search for distance decay effects in the utilisation of individual medical care facilities. This can include primary physician and general practitioner care, dental care or general hospital care. *Potential accessibility* on the other hand involves the examination of geographic displacement of medical care services and their potential clients. As has been suggested by Donabedian (in Joseph 1986) utilisation is the fundamental indicator of access. Joseph notes that revealed accessibility has two important drawbacks. Firstly, studies of demand require considerable amounts of data especially if you are looking at a local area scale. Secondly, and more importantly, measures of access based on utilisation "are hampered by in their interpretation by the multiplicity of factors affecting the use or non-use of services" (Joseph 1986:11). Distance decay effects, when detectable, may be extremely 'fuzzy', and their stability may depend upon the often unknown status of other non-spatial factors (Joseph and Phillips 1984). Research on potential access to health care has been carried out at several scales with the predominant focus on primary physicians. In contrast to revealed accessibility, potential accessibility has less data requirements, and focuses on the specific impact of a single dimension of access.

Effective accessibility is distinct from the locational or spatial model described above. Joseph and Phillips (1984) present five models that archetype the key features of population characteristics, service characteristics and other variables that predict or influence aspatial utilisation or access. This is presented in Table 2.2.

Table 2.2: Modeling of aspatial utilisation

Period	Model	Description
1959 - 1960	Rosentock Model	Psychological-motivational determinants of health service utilisation
1964 - 1966	Suchman Model	Socio-cultural and environmental determinants
1968	Anderson Model	Family life cycle determinants
1972	Gross Model	Behavioural components
1974	Aday and Anderson Model	System as modifier

Adapted from Joseph and Phillips 1984

The Rosentock model stresses that the emotional rather than the cognitive beliefs of a person are crucial to understanding utilisation. Once the psychological state of readiness to use health services exist, a 'cue' may trigger action. Suchman's model emphasises the influence of social groupings and linkages on utilisation. Suchman notes that attitudes to illness and awareness of treatment can vary considerably among cultural groups and socio-economic class. Minority and lower socio-economic groups tend to be more fearful or sceptical of medical care and become more dependent on lay advice. Anderson's model explained differences in access in terms of a sequence of conditions which tend to regulate the volume of services used. This can be summarised as set of factors which may predispose towards utilisation – family composition, social structure and health beliefs for example. Gross builds on Anderson's model and has proposed a regression model operating within a behavioural framework (Joseph and Phillips 1984). Aday and Anderson model builds further on the Gross and Anderson models and suggest that access may be gauged by the utilisation of services by designated populations for whom they are intended. Furthermore, they further suggest that access may be even more appropriately considered in the context of whether those persons actually in need of medical care actually receive it (Joseph and Phillips 1984). For a complete discussion of the these models the reader is directed to Veeder (1975), Rosentock (1960 and 1966), Suchman (1964 and 1966), Anderson (1968) Gross (1972) and Aday and Anderson (1974).

2.4.2 The influence of supply

As has been described above, a key factor identified as contributing to geographical variations in hospital use is the influence of health service provision, in terms of the supply of hospital beds, medical staffing and resources. Brown and Barnett (1992) outline three ways in which health care delivery systems can influence individual utilisation behavior:

- Through the supply of health care resources that are available for use
- Through the organisational structures that are in place
- Through the beliefs and attitudes that underpin both the provision and use of health services

The physicians, as a 'gatekeeper' to the health system, is in a position of great influence, as they are both an advisor and a link between the available services (Pyle and Lauer 1975). The basic premise behind Supplier Induced Demand (SID) is where the supplier (physician or hospital) is able to generate demand for their services. As holders of 'exclusive knowledge' they are able to dictate demand for services (Troughton 1993). Thus in a market sense physicians are oligopolist, as there is little real competition for the service. Some have argued that SID is part of a natural occurrence (Malcolm 1987), while many others have concluded that it is part of an intentional action to generate income (Logan *et al.* 1989).

Arguably the most important determinant of hospital admissions, from a supply-side perspective, is the availability of bed space. If there is space then people will be admitted and/or kept in hospital for longer periods. Roemer's Law argues that there has always been a demand on bed space, regardless of need and past admission rates. Length of stay rates have increased proportionately to bed space, so the overall effect is a greater impetus on hospital admissions and treatments. Roemer (1961) concluded that there were four main reasons for this change. First, a larger and more attractive hospital would have a greater pull factor. Second, with better facilities and more space the was an increasing tendency to hospitalise. Third, was the issue of staff expansion – more staff to care for patients. Finally, Roemer highlights the difficulty of

assessment, as there are no formal procedures in place to review justifiability of patient occupancy.

The consequences of SID and Roemer's Law have far reaching effects on health care and health care delivery. SID in particular is predominant at the primary care level (Barnett 1993), and the effect can filter through into the secondary level of health care. In Roemer's Law the initial impacts are viewed at the secondary level, but have permeated through all stages of the health care system (Troughton 1993). The problem of 'overservicing' – a by-product of the physicians ability to dictate demand – creates greater demand for services and longer waiting periods. Another problem is that of physician oversupply – as physicians are more likely to locate to areas of denser populations. This can cause unequal distribution of physicians and raise the cost of treatment as more physicians compete for fewer patients.

2.4.3 Determinants and influences of utilisation

Social class, income, age and ethnicity has a major influence on utilisation behaviour. Joseph and Phillips (1984) argue that social class has the most persuasive influence. However, it is difficult to distinguish clearly its effects because definitions of class vary, and as a variable, social class is intricately connected with occupation, income and education. The effects of income are also hard to distinguish from those variables more broadly attributable to socio-economic status. Recent literature in New Zealand suggest that up to 70% of residents put off a visit to the doctor because of cost (Jamieson 1998). It is also quite possible that income indirectly affects utilisation and under-utilisation. Some lower income regions are poorly provided with medical facilities and this in itself may cause lower levels of utilisation (Joseph and Phillips 1984).

Age and sex are important variables influencing health service utilisation. It may be expected as people get older, they will need health services more for chronic and acute conditions. Women, as the reach child-bearing age, can be expected to utilise health facilities more. Numerous studies have found that females have higher morbidity than males (Joseph and Phillips 1984). The underlying reasons for

differences in morbidity are varied and often unclear although they are probably related to genetic, environmental and occupational factors. Feldman (1966) contends that women may use health services more than men as they generally have more knowledge about health matters. As women also live longer on average it is difficult to generalise the effects of sex and age (Joseph and Phillips 1984).

The cultural or ethnic background of individuals has been suggested as cause of differential utilisation behaviour in health services. In the United States it is suggested that preventive medicine is very much a white, middle class preserve that which racial/ethnic minorities will use less (Joseph and Phillips 1984). Within western countries ethnicity can underlie access to inferior health facilities due to residence in inferior locations. Under-utilisation may also be related to poverty, a lack of faith in the system to provide for ethnic minorities, or poor communication between doctor and patient. Ethnicity is closely related to income and socio-economic variables as ethnic minorities are amongst the poorer groups in society (Joseph and Phillips 1984). Other determinants of utilisation can include such factors as lifestyle, diet, actual health status, disability or occupation. McKinlay (1972) points out that the social-psychological approach to explaining utilisation, including motivation, perception, and learning are deemed to be key elements in determining utilisation behaviour, but has been largely neglected by the literature.

2.5 Summary

In this chapter the current patterns and processes, linking health and deprivation have been discussed. We have identified a number of issues involved in the defining and measuring of health, inequality, poverty and deprivation. Each term can be broadly interpreted and can overlap at some stage with each other. This interpretation is a common theme throughout the literature. We have found that there is substantial evidence that health status is highly correlated with socio-economic status. Therefore if the primary goal of health policy is to improve the health status of the population it is essential to focus on economic and social determinants of health. Some of the factors that effect health, such as age, gender and genetic makeup, cannot be changed by individual choice or public policy.

The relationship between socio-economic status and health typically takes the form of a curvilinear gradient, with increments in socio-economic status precipitating successively smaller gains in health status as one ascends the socio-economic strata. Similar trends are seen in the relationship between ethnicity and health. We have seen in New Zealand the health experience of Maori reflecting what is broadly accepted as an international tendency in the relationship between ethnicity and health. The nature of space, time and place is inherent in the discussion of health variations. There is extensive evidence which support the argument that *contextual* health effects associated with place and space may contribute to health variation with three types of theoretical framework; spatial patterning and diffusion of physical and biological risk factors; social relations; and sense of place.

Health care, like many public services, is not equally available to all individuals. It has be contended that hospital utilisation is related to many factors including demography, morbidity, medical resources, access, selection for care and physician practice patterns – but two interrelating forces make up the greatest impact - a *need* or *demand* based variation and *supply* based variations. It is these variations that need to be considered when determining why different groups utilise hospital at different rates. The following chapter introduces historical and current research trends in a New Zealand context.

CHAPTER THREE

HISTORICAL AND CURRENT RESEARCH TRENDS IN NEW ZEALAND

3 Introduction

Where Chapter Two confined discussion to current theory as to the issues pertaining to health and deprivation, in this chapter these issues are reviewed within the context of a New Zealand framework. Section One enters into discussion of the patterns of inequality in health, and the trends over time. Special emphasis is given to Maori health inequality. Following from this discussion, in section two, is an examination is made of the inequalities in the use of health services. In particular, patterns and trends are discussed with reference to primary and secondary care sectors. Section Three looks at the key causes in why there are such differences in health equality in New Zealand. Particular attention is played on the role of government in the reworking of the economy and the welfare state. In doing this it suggests a number of structural factors related to the reform of the welfare state that has had far reaching health consequences, especially for lower income groups. Discussion is also centered on recent health reforms including hospital restructuring and reforms in the primary care sector. Section Five discusses Christchurch, as the location of the case study, and its suitability for this type of study are discussed.

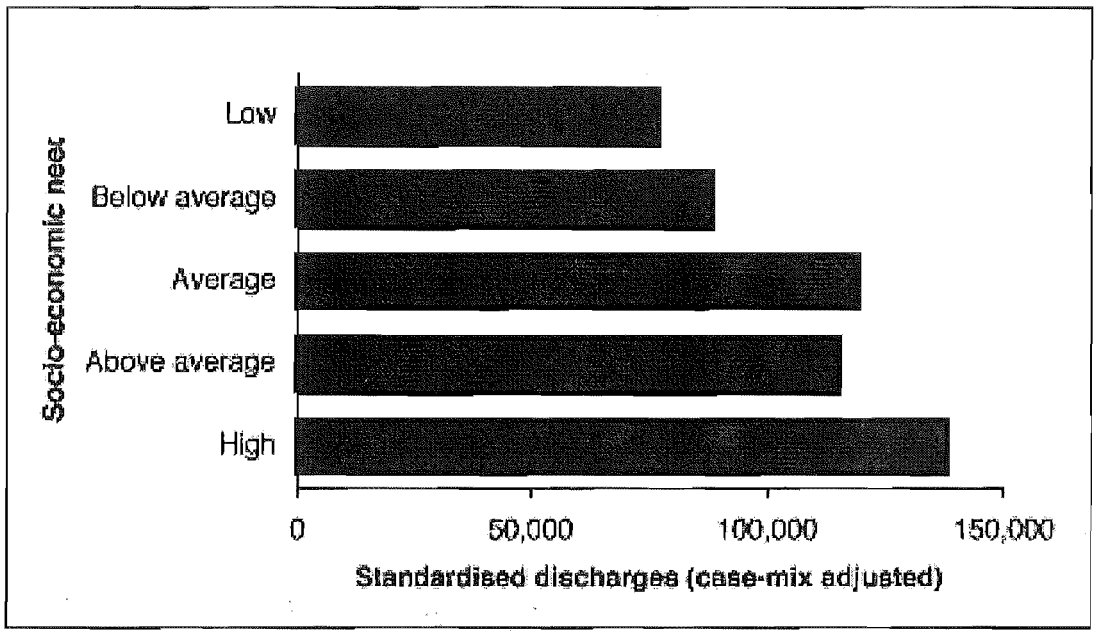
3.1 Inequalities in health

There is an increasing volume of New Zealand research that supports the huge body of international evidence demonstrating the striking association between deprivation or socioeconomic status and health status. This section discusses the patterns of inequality and trends over time with relevance to New Zealand research, and then reviews research undertaken at the national scale, and at the regional and local scales. Particular attention is given to Maori, as various statistics have shown Maori suffer worse health outcomes than non-Maori.

3.1.1 Comparing New Zealand and overseas studies

New Zealander's have generally had access to good quality healthcare for well over a century. Recent statistics show some groups in society are experiencing worse health than there peers, and that this gap is increasing. Inequality in health can be

demonstrated by the fact that individuals from the lowest socio-economic group are 1.5 time more likely to be admitted to hospital. This is illustrated in Figure3.1.



Source: Ministry of Health 1998a

Figure 3.1: Total New Zealand public hospital discharges, by socio-economic need, 1996/97.

The international literature on socio-economic status and health is dominated by UK and US studies, but some notable work has been undertaken in Canada, Australia and Europe. There is, however, need for caution when considering the relevance of these studies to the New Zealand situation. The population density of European and North American countries is generally much higher than that of New Zealand, many of the spatial analyses that are considered 'small area analyses' would actually be equivalent to regional analyses at the Regional Health Authority level in New Zealand in terms of population numbers. Hence the level of homogeneity of the population in a 'small area' in the UK may be much greater than an area in New Zealand with a similar population size. New Zealand's population is likely to undergo higher rates of internal migration than that of the UK and other European countries. For example, according to the 1991 Census, 20.1% of the New Zealand population had lived at their place of residence for under one year and 30.3% for under two years (Department of Statistics 1992). This is important when considering conditions which generally have long

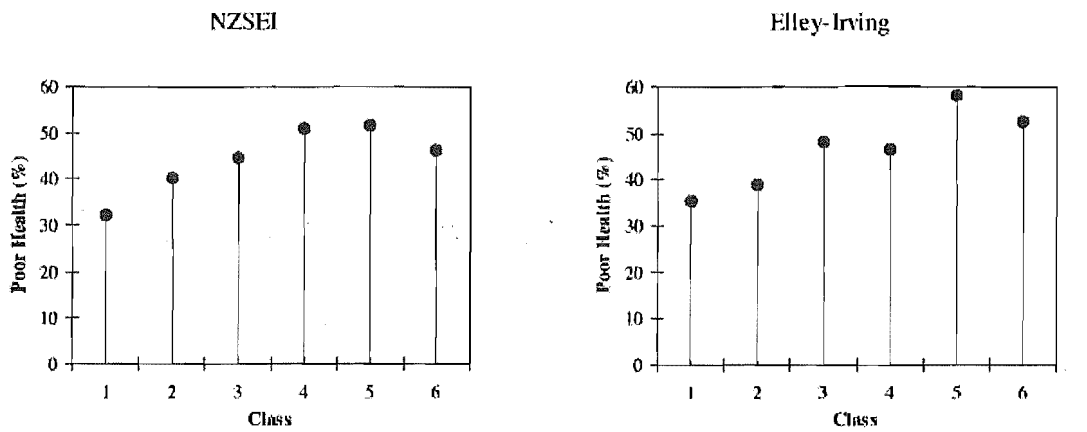
latency periods (e.g. cancer and cardiovascular diseases). New Zealand has unique socio-demographic characteristics associated with its population of Maori and Pacific Islands people. There are also distinct patterns of urban and rural settlement, including such groupings as relatively high proportions of rural Maori (e.g. in Northland and the Eastern North Island). There may also be a less marked social-class differential and more homogeneity in educational achievement than in such countries as the UK and the US. New Zealand lacks some of the heavy industry that has been associated with environmental health concerns overseas (e.g. nuclear power generation). Also where these industries exist, such as for steel production and aluminum production, the surrounding areas are often rural with a relatively low population density. Even with urban-based industries the surrounding urban population density is relatively low compared to countries such as the UK (Wilson *et al.* 1996)

3.1.2 Research at the national scale

The role that socio-economic status has on health in New Zealand has largely concentrated on mortality. Such work has examined differences in coronary heart disease with social class (Kawachi *et al.*1 1991) and mortality in relation to social class (Pearce *et al.* 1983; Pearce *et al.* 1991; Marshall *et al.* 1993). Kawachi *et al.* (1991) found that that although there had been a decline in mortality related to coronary heart disease, the differential between socio-economic groups had actually increased. Pearce *et al.* (1991) found that although overall mortality rates have decreased, the differential between higher and lower socio-economic groups had increased in recent years, with lower socio-economic groups having significantly higher mortality rates than higher socio-economic groups. There has been investigations of mortality, class and ethnicity (Pearce *et al.* 1993; Mitchell and Borman 1989). Maori have been shown to have higher aggregate levels of mortality than non-Maoris particularly for males aged 15-64 years (Smith and Pearce 1984). The relationship between unemployment and health is well developed, with those who are unemployed having significantly higher levels of mortality and morbidity than those gainfully employed (Pearce 1991). The role that unemployment has on health is also seen with respect to psychological and mental health (Barnett and

Howden-Chapman 1994). A review of some of the relevant international and local literature in the area of socio-economic status and health has also been conducted by Barwick and Nuthall (1992).

Davis (1997) in a discussion of the validation of the New Zealand Socioeconomic Index (NZSEI), compared the self-reported health status of individuals using the NZSEI and Elley Irving socio-economic indices. Figure 3.2 below clearly shows the gradient between the highest (1) and lowest (6) socio-economic classes, using occupation as a proxy. (These indices are discussed in full in Chapter Four)



Source: Davis *et al.* 1997

Figure 3.2: Self-reported health status, NZSEI vs. Elley Irving

3.1.3 Research at the regional and local scales

There has been very little research based on small areas, comparing hospital admissions to deprivation or socio-economic status. Jackson (1999) has undertaken an analysis of deprivation in South Auckland, using hospital discharge data. In summary he found a very strong relationship between deprivation and hospital discharges. For every decile increment in deprivation Jackson found an 11% increase in hospital discharges. In a North Health commissioned report (Jackson *et al.* 1998) the relationship between mortality, hospital discharges and socio-economic status was examined. They found that during the 1982–1994 period mortality rates were consistently highest for the lowest socio-economic groups and the lowest for the highest socio-economic group. Hoskins (1990) also compared the relationship

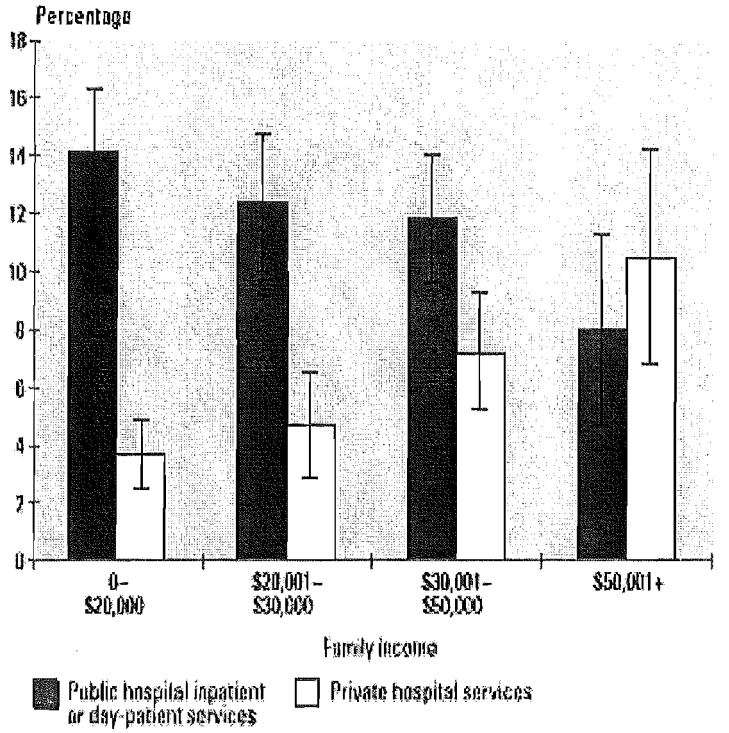
between socio-economic status and hospital discharge rates. A strong positive correlation was found between the health and equity index (see Chapter Four for a full description of this index) and standardised hospital admission rates in the Auckland urban area. Several other researchers (for example Pierce 1983) have examined social class or occupation and a subset of hospital discharge records, both at a regional level (Auckland) and at a national level. All have reported higher morbidity or mortality rates as the social or occupational class decreases. In the southern region of the South Island Maori fare worse than non-Maori on most health indicators, with higher hospital admissions in all age groups, and higher death rates nationally in age groups over 25 years from many causes (Health Funding Authority 1998).

3.1.4 National Health surveys

Another way of measuring health status is to ask people for a self assessment of their health. As discussed in Chapter Two this can introduce an element of subjectivity into the definition of illness. One of the main advantages is that it is more directly concerned with well being than with actual sickness and has been found to correlate closely with health outcomes (Department of Statistics 1989). The first national Household Health Survey was undertaken in 1992/93. This was a representative telephone survey of 7065 New Zealanders. The 1996/97 New Zealand Health Survey was the second nationally representative survey of the health status and health service utilisation of New Zealanders. The survey had a sample size of 7862 adults (15 years and over) and 1019 children. According to the survey just over 1 in 10 adults were admitted to a public hospital as an inpatient or day patient at least once in that period. In the 1992/93 Health Survey 13% of New Zealanders were admitted to public hospitals in the previous year (Ministry of Health 1995). In general, adults in the older age groups were more likely to be admitted to a public hospital than those in the younger age groups, with 21.5% of people in the 75 plus age group admitted in the past year. Exceptions to this trend were women in the two youngest age groups, 15–24 and 25–44. These women were more likely to be admitted to a public hospital than women in the 45–64 and 65–74 years age groups, reflecting their use of public hospital maternity services during the child-bearing years.

There were significant differences across ethnic group in the likelihood of being admitted to a public hospital. Fourteen percent of Maori, 13.2% of Pacific island adults, 10.5% of European, and 5.6% of adults from the Other ethnic group were admitted to a public hospital in the past year. Admissions to public hospitals decreased with increasing income, dropping most sharply in the highest income group. Similarly, when people's use of public hospital inpatient and day-patient services was compared to their NZDep96 score, adults from the more deprived NZDep96 groups were more likely to be admitted to a public hospital than adults from the less deprived NZDep96 groups. Fourteen percent of adults from the most deprived areas had been admitted to a public hospital in the past year, compared to 8% of adults from the least deprived areas. In addition, those with fewer educational qualifications were more likely to be admitted to a public hospital (Ministry of Health 1999). There was a similar negative association between income and hospital admissions in the 1992/93 Health Survey (Ministry of Health 1995). One contributing factor to the above trends may be the greater affordability of private medical insurance and private hospital care for people in the higher socioeconomic. Another reason is that people in the lower socioeconomic groups may be more likely than other people to experience health problems that can only be treated by specialised services available in public hospitals.

Comparing adults admitted to public hospitals with those of adults who used private hospital services revealed some interesting trends. As Figure 3.3 shows, adults from the higher income groups were more likely to use private hospital services in the past year, while adults in the lower income groups were more likely to be admitted to public hospitals. Eight percent of European adults used a private hospital service in the past 12 months, more than twice the rate for Maori and Pacific adults (2.9% and 2.6% respectively). This result may in part reflect differences in socioeconomic status across ethnic groups.



Source: Ministry of Health 1999

Figure 3.3: Adults' use of inpatient or day-patient public hospital services and any form of private hospital services in the past 12 months, by family income (age- and sex-standardised)

As well as admitting people as inpatients and day patients, public hospitals also provide a variety of services to people without admitting them to hospital. These services are usually obtained at a hospital outpatient department or an accident and emergency department. The 1996/97 Health Survey found that just over a quarter of adults and a quarter of children were either admitted as an inpatient or day patient to a public hospital, or used a public hospital outpatient department or accident and emergency department in the previous 12 months. Extrapolated to the New Zealand population as a whole, this represents an estimated 750,278 adults and 211,266 children who used some kind of service at a public hospital.

The 1996/97 Health Survey found that European, Maori and Pacific Island adults had similar rates of public hospital outpatient department use, although the rate was lower for adults from the Other ethnic group. The 1992/93 Health Survey showed the same proportion of New Zealanders used a public hospital outpatient department in the past

12 months, and, similarly, there was no difference between Maori and non-Maori (Ministry of Health 1995). Those adults in the highest family income group, living in least deprived areas of New Zealand and with the highest educational level were less likely than those from other family income, NZDep96 and education groups to use public hospital outpatient department services. In part this will be because adults from the more advantaged socioeconomic groups have fewer long-term health conditions. It may also be because they are more likely to be able to afford to pay for private specialist services, rather than attend a public hospital outpatient department. It could be also due to the fact that adults from the higher income groups are more likely to see a medical specialist at a private clinic or hospital rather than at a public hospital, whereas the reverse is the case for those in the lower income groups. The 1996/97 Health Survey (and the 1992/93) clearly show that there is a clear difference in health service utilisation by different groups in society, with the less well off (lower family incomes, most deprived and ethnic groups) exhibiting higher utilisation of health services. Table 3.1 depicts different types of usage by accepted indicators of socio-economic status.

Table 3.1: Summary of 1996/97 Health Survey with relation to hospital admissions

	Total Public Hospital Services Utilisation*	Admitted to Public hospital*	Accident and Emergency dept. use*	Outpatient dept. use*
Ethnicity				
European	26.8	10.5	10.9	13.7
Maori	29.1	14.2	12.9	12.0
Pacific	30.8	13.2	9.6	12.0
Other	17.9	5.6	6.3	6.0
NZDep96 Score#				
1-3(least deprived)	23.3	8.2	10.0	9.8
4-5	25.9	9.8	11.1	13.8
6-7	27.3	11.7	10.1	13.6
8-10 (most deprived)	31.2	13.5	12.1	15.9
Family Income				
0-$20000	30.4	14.1	10.1	16.3
$20001-30000	30.0	12.4	11.4	14.4
$30001-50000	29.1	11.8	12.3	14.6
$50001+	21.4	8.0	10.2	9.2

Source: Ministry of Health 1999

* Standardised by age and sex

See section 4.3.2 for complete description of the NZDep96

3.1.5 Maori and health

As has been discussed in Chapter Two, ethnic minority status has been widely identified as an independent risk factor impacting on health outcomes (Kaplan 1989). In New Zealand, the health experience of Maori exemplifies what is broadly accepted as an international tendency in the relationship between ethnicity and health. As also discussed in Chapter Two definitions of health reflects the ideology and culture of the most powerful groups in society and minority groups have traditionally been marginlised by European style health care systems. This, combined with the generally low socio-economic standing of minority groups provides for poor health status. The summary of 1996/97 Health Survey with relation to hospital admissions (Table 3.2 above) shows how Maori and Pacific Islander's are more likely to utilise hospital services. Maori experience an excess burden of mortality and morbidity throughout life, starting with a higher infant mortality, higher rates of death and hospitalisation in infancy, childhood and youth, and higher mortality and hospitalisation rates in adulthood and older age (Pomare *et al.* 1995). The overall higher Maori mortality rates compared to non-Maori also exist within individual social classes (Pearce *et al.* 1993). Table 3.2 compares Maori and non-Maori health status in New Zealand.

Table 3.2: Comparison of Maori and non-Maori health status

	Maori	Non-Maori
Life expectancy (years at birth)	72.9 (Female) 68 (Male)	79.2 (Female) 73.4 (Male)
Death rates (per 100,000 population)	675.5 (Female) 850.8 (Male)	414.6 (Female) 665.2 (Males)
Infant death rates (per 1,000 live births)	18.4	11.4
Total fertility rates (average number of children per woman)	2.28	2.10
Hospitalisation rates – Non-mental Health (per 1000 population)	190.0	138.0
Hospitalisation rates – Mental Health (per 1000 population)	850.0	560.0
Average length of stay in hospital (days)	5.20	5.90

Source: Durie 1994

There are many causes for this gap between Maori and non-Maori mortality and morbidity, but the major reason is seen to be that Maori are more represented at the

lower end of the socio-economic scale. Smith and Pearce (1984) estimated that up to 20% of Maori mortality is related to ethnic differences in socio-economic status. A report by Health Funding Authority (1998) attributed the higher than average rates of ill-health to the greater socio-economic disadvantage experienced by Maori as a whole, and to the cultural barriers that prevent easy access to health services. Kearns and Smith (1993) attributes this increasing marginalisation of Maori to the reform of the welfare state. Pomare *et al.* (1995:150) concludes that the "changing state sector policies and their impact on employment and income may have prevented the benefits of Maori development from reaching Maori individuals and whanau". Therefore, to maximise effectiveness for Maori, health should be linked with other services to address social, cultural and economic conditions. Table 3.3 shows the levels of benefits received by ethnicity and gender in 1991. Maori are also over-represented in such socio-economic indicators as income, crime and education levels.

Table 3.3: Levels of benefit receipt by ethnicity and gender, age groups 15-19, 20-39 and 40-59, 1991 census

Age groups	15 - 19		20 - 39		40 - 59	
	Male	Female	Male	Female	Male	Female
Maori	37	40	56	82	45	67
Pacific Islander	26	26	44	67	43	65
European	24	27	25	65	24	49

Source: Le Heron *et al.* 1996 (after Davey 1993)

Several researchers have documented the persistence of a substantial 'ethnic effect' on health outcomes even after socioeconomic status has been taken into account. In his analysis of New Zealand mortality statistics for example, Davis (1997) found that 80% of the excess of Maori over 'other' deaths is not removed when the comparison is standardised for social class. Durie (1985) contends that interventions aimed specifically at lower socioeconomic groups will be unlikely to eliminate the current mortality differences between Maori and non-Maori. Macintyre (1986:399) observes that "many forms of disadvantage related to ill-health are themselves inter-correlated (for example, being non-white, working in an unskilled occupation or being

unemployed, living in the inner city, being the female head of a single parent family) and disaggregating these components may misleadingly mask the effects of these simultaneous and overlapping vulnerabilities". It seems that ethnicity must therefore be granted a degree of ontological autonomy in explanations of the socio-structural patterning of health (Davis 1997).

The relative poor health of Maori may also result from a number of other factors. Maori may have a genetic predisposition to some diseases, for example rheumatic fever and diabetes (Pomare *et al.* 1995). Some of the excess Maori morbidity and mortality is due to differences in the uptake or effectiveness of health services. In addition, poorer Maori health status can be attributed in part to high rates of smoking and other behavioural risk factors. Cultural factors also appear to be important (Pomare *et al.* 1995).

In general, Maori view health in a way that has been traditionally alien to western or European people. For Maori people true health requires a balance between four dimensions as depicted in Table 3.4 - the Maori model of health as seen through a European researcher.

Table 3.4: Maori Model of Health

	Taha Wairua	Taha Hinengaro	Taha Tiana	Taha Whanau
Focus	Spiritual	Mental	Physical	Extended family
Key Aspects	A capacity for faith and wider communication	A capacity to communicate, to think, and to feel	A capacity for physical growth and development	A capacity to belong, to care, and to share
Themes	Health is related to unseen and unspoken energies	Mind and body inseparable	Good physical health is necessary for optimal development	Individuals are part of a wider social system

Source: Durie 1994

The relations between the Crown and the Maori are fundamental to considerations of health equality. Article three of the Treaty of Waitangi places obligations on the state to provide Maori with the resources needed to restore their health to the level of other

New Zealanders (Woodward *et al.* 1998). The policy document, *Whaia te Ora mo te Iwi*, outlines six general principles for improved Maori health care:

Equity	Increase access to services for Maori , decrease disparities in health status between Maori and non-Maori and give greater weight to Maori health gains
Effectiveness	Identify and address diverse Maori realities and reflect these in planning, design and purchasing of health and disability support services, with particular emphasis on primary care services to ensure early intervention
Efficiency	Seek to purchase innovative Maori health initiatives, especially in primary care, in light of potential costs and benefits over the medium term
Safety	Ensure that adequate systems and response are in place to eliminate, reduce or isolate risks of avoidable cultural harm
Acceptability	Consult with, involve and be responsive to the diverse needs of Maori, and recognise Maori aspirations for self-management and preferences for services to be provided by Maori
Risk management	Ensure that the risks associated with poor Maori health status are identified and addressed

The Regional Health Authorities have implemented strategies of mainstream enhancement and Maori provider development in order to support health gain for Maori. In particular, all RHA's have given considerable emphasis to the development of Maori providers of health and disability support services. Progress in improving the cultural appropriateness of the mainstream providers with whom the RHA contract has been much slower. While all RHA's have followed strategies of mainstream enhancement and Maori provider development, there has been variation in the extent in which these strategies have been implemented. A key feature of Southern RHA's planning cycle has been an annual hui at which Maori can voice their concerns with respect to the purchase and provision of services, and identify what they see as the priorities for Maori health. During 1996/97, Southern RHA signed a contract with Te Runanga o Ngai Tahu, to undertake consultation with all Maori in the Southern region on behalf of the RHA. This gives the Southern RHA a strong link to the Maori community, and recognises the importance of involving tangata whenua in providing advice to the Southern RHA on its purchasing and strategic development (Ministry of Health 1998b).

Obtaining valid figures on Maori mortality or morbidity is problematic in itself. Some workers have found limitations with the accuracy for denominator populations of particular ethnic groups such as Pacific Islands people in South Auckland (Simmons *et al.* 1994). A large household survey, conducted 12 months after the 1991 Census, found that the Pacific Islands people population was 39.6% larger than suggested by this census. In the Southern region of the South Island, denominator counts are hampered by the small numbers involved. Research has found errors in coding of ethnicity of up to 30 percent and the Northern RHA reported that the coding of up to three ethnic groups per patient was very variable. Public reluctance to provide ethnicity another reason for difficulty in coding ethnicity information. The Southern RHA (now Health Funding Authority) has had a long standing problem in obtaining accurate data on Maori mortality and hospital admissions, due to inconsistency in the ways in which people identified as Maori by hospital staff, and the tendency to under-report people as Maori (Te Puni Kokiri 1993). Changes to ethnicity coding in the National Minimum Data Set (NMDS) to a self-identified multiple ethnic origin basis is hoped to minimise these errors. In addition to focusing on ethnicity information in the inpatient hospital setting, RHA's have also focused on improving primary care information on Maori health. Some RHA's have included a clause in its GP and independent service providers contracts, requiring an intention to improve the accuracy of ethnicity data. However, it considers that increased use of the National Health Index (NHI) may be a better lever to the success of accurate ethnicity data collection (Ministry of Health 1998b).

3.2 Inequalities in the use of health services

3.2.1 Health equality issues in the primary and hospital sectors

The primary healthcare network in New Zealand acts as a gatekeeper for the secondary or hospital sector. Therefore, the issue of access and utilisation of the primary healthcare system is instrumental in examining trends in the secondary sector. Grant *et al.* (1997) contend that the primary care system currently in place creates both geographical and financial barriers to access. General practitioners are unevenly distributed throughout New Zealand creating difficulties in obtaining

appropriate care in some areas. The inequality of distribution in part, can be blamed on market forces. In 1990 – 91 high income families in New Zealand spent 2.7 times as much on general practitioner services as did low income families. Recent studies have shown that cost sharing has acted as another barrier to accessing primary health care - see for example Clarkson and Lafferty (1984) study of child consultations, Davis (1985) comparison of lower and higher socio-economic clients and Dixon *et al.* (1994) examination of delay in seeking care.

Unmet health need because of financial considerations is also significantly related to ethnicity and socio-economic status. This is shown in Table 3.5, which is based on data collected from the 1996/97 Health Survey (Ministry of Health 1999).

Table 3.5: Unmet need relating to socio-economic variables

	% of people needing but not visiting GP*	% of people who cited cost as main reason for not visiting*
Ethnicity		
European	11.6	43.2
Maori	18.6	48.9
Pacific	17.5	73.5
Other	11.5	42.4
NZDep96 Score#		
1-3(least deprived)	9.4	-
4-5	12.6	-
6-7	13.3	-
8-10 (most deprived)	15.0	-
Family Income		
0-$20000	16.5	-
$20001-30000	14.5	-
$30001-50000	11.3	-
$50001+	12.1	-

* Standardised by age and sex
- No data
See section 4.2 for complete description of the NZDep96

As can be seen in Table 3.2 above financial barriers in combination with a system that does not ensure equitable distribution of general practitioners has created considerable difficulties in obtaining primary care for some sectors of New Zealand's population (Grant *et al.* 1997). According to One Network News (9 July 1997) 71% of general practitioners believe that their patients are delaying seeing their doctors because of

cost. This in turn has provided additional pressure on the secondary or hospital sectors, by the way of increased admissions that might not have been necessary with accessible primary care.

3.3 Why such differences in New Zealand?

Section Three looks at the key causes in why there are such differences in health equality in New Zealand. Particular attention is played on the role of government in the reworking of the economy and the welfare state. In doing this it suggests a number of structural factors related to the reform of the welfare state that has had far reaching health consequences, especially for lower income groups. Discussion is also centered on recent health reforms including hospital restructuring and reforms in the primary care sector.

3.3.1 Economic and welfare restructuring

Since the election of the Fourth Labour government in 1984 New Zealand has experienced a radical transformation of both its economy and social services. For a country that has had a long history of state involvement the change to "an almost unfettered market driven society" has been unprecedented any where in the world (Britton *et al.* 1993:53). The 'rolling back of the state' created three new initiatives in reducing the governments involvement in running of the state. Firstly, the move to separate and corporatise commercial functions in the state sector, and the reforming of public service sector. Secondly, a drive to privatise state-owned enterprises, and thirdly the reform of social policy, including both changes to the extent of entitlements and to the means by which they are delivered (Le Heron *et al.* 1996). Of particular interest to this thesis is the reform of social policy which has had a major effect on the level of deprivation in New Zealand and the move to corporatise the health sector.

The welfare state has been suggested to have occurred due to three main assumptions; these being the market both succeeds and fails; that state welfare preserves self respect; and that welfare helps to sustain an integrated society (Mulgan *et al.* 1991).

The New Zealand welfare state was formed in 1938 under the Social Security Act by the first Labour government. Ironically, the fourth Labour government, began the process of dismantling the welfare state, now described by Bryson (1992:36) as "a minimum level of institutionalised provisions for meeting the basic economic and social requirements of its citizens". Labour's more traditional interests, represented by the incumbent Prime Minister, saw the fiscal savings generated by commercialisation and corporatisation as freeing resources to reinforce the effectiveness of the welfare state (Britton *et al.* 1993). This was in contrast to other members of Labour's caucus and contributed sharply to the disintegration of the party in the 1990 elections. The predominantly managerialist course pursued by Labour within the public sector was not followed, however, by the newly elected National government in 1990. The National government pressed towards New Right solutions with strong elements of privatisation (Kelsey 1997).

The parties of the Right have traditionally defended inequality in the name of tradition and order. The(in)famous 'trickle-down' theory supported the idea that by making the rich richer, the poorer would be made richer too. Okun (1975 p. 120), a 'free marketeer', sums this argument up as:

> ...reflecting a system of rewards and penalties that is intended to encourage efficiency and channel it into socially productive activity. To the extent that the system succeds, it generates an efficient economy. But that pursuit of efficiency necessarily creates inequalities. And hence society faces a trade-off between equality and efficency.

Hirschman (1991) describes three arguments that are traditionally used against reform of the welfare state – the futility, perversity and jeopardy theories. The futility theory takes various forms but is based on the view that attempts at social transformation will fail to reduce inequality. The perversity theory states that any attempt to improve political, social or economic order will produce the exact opposite. Charles Murray (1984), a prime proponent of the perversity thesis, argues that trying to provide more for the poor actually creates more poor. The jeopardy theory argues that the cost of the proposed change or reform is too high as it can endanger some previous

accomplishments. Le Heron *et al.* (1996) raise three similar key issues on the subject of welfare reform in New Zealand. Firstly, state welfare systems have been operating for up to fifty years and have failed to eliminate poverty. The second issue is the that expenditures on social welfare have grown rapidly and are alleged to be unsustainable and hampering economic growth. Finally, the moral basis of income support polices has been increasingly attacked as giving the wrong signals, providing disincentives to work and encouragement of dependency (echoing Charles Murray's theory of perversity).

The National governments response to the ever burgeoning welfare role, as depicted in Table 3.6, was to implement a wide ranging package of cuts. The abolition of the Universal Family Benefit , the revision of eligibility rules and lengthening of stand-down periods was coupled with a sharp reduction in the benefits themselves (Le Heron *et al.* 1996). Further policy changes included policies that limited the effectiveness of, or deny clients access to, targeted supplementary assistance and funding cuts in important support services (such as funding to community social service agencies). Further state sector restructuring included Housing New Zealand rent rises, changes in the health system (particularly the purchaser/provider model) and the Employment Contracts Act which changed the nature of work especially in terms of job security for those reliant on limited income paid employment and its relationship to unemployment. These central government policies have played a role in both exacerbating, and in acting as a precursor to, poverty and hardship for the least advantaged people in New Zealand (Jamieson 1998).

Table 3.6: Receipt of income support by age and gender (1981, 1986, 1991)

	% of gender and age group which received any type of benefit					
	1981		1986		1991	
Age group	Male	Female	Male	Female	Male	Female
15 -19	7	13	13	17	27	29
20 - 39	7	68	13	64	38	67
40 - 59	7	51	10	48	26	51
60 - 74	98	98	94	97	95	97
75 plus	99	99	97	98	97	98

Source: Le Heron *et al.* 1996 (after Davey 1993)

The neo-liberal perspective contends that the role of the government is to provide a modest safety net, whilst producing policies that encourage sustained economic growth and job creation. While some economic growth may be occurring, other commentators have pointed to the growing income disparity, real poverty, and the marginalisation of significant sections of the population (Le Heron 1996). The current National led government has resisted acknowledging the existence of poverty and the growing income disparity, but has focused on the (seemingly) positive aspects of the low inflation and unemployment. As the country nears an election on the 27th of November 1999, opposition parties from the left are making more light of the negative aspects of the so called 'New Zealand experiment'.

All though New Zealand's neo-liberal economic theories have been proclaimed internationally as a success story, others have argued that this is not the case. Kelsey (1995) challenges the 'New Zealand success story' by examining New Zealand's economic and social well being. She estimates that the number of New Zealanders living below the poverty line rose by about 35% between 1989 and 1992. By 1993, one in six New Zealanders were considered to be living in poverty. When all the changes to income support were collated and compared across New Zealand, researchers found that households in the lowest income brackets had lost the most in dollar amounts and that families with children had lost more than those without children (Dann and Du Plessis 1992). These changes have had an immediate impact

on the lives of the least advantaged. Other statistics echo the ever widening gap between the poor and the rich – the equivalent household disposable income of the bottom decile (10%) dropped by 14%, while that of the top decile actually increased by 13.5% between 1984 and 1993 (Hassall 1996). These statistics all point to an increasing level of deprivation in New Zealand.

3.3.2 Hospital restructuring

One of the fundamental public perceptions of health care in New Zealand is the assumption that a publicly-funded health system should be able to provide unlimited amounts of quality health care (CCMAU 1996). No matter how much money is provided for health care, the demand for services, fuelled by advances in technology and an aging population, will always outstrip the Government's ability to supply. Over the past 15 years the public health system has undergone two major reform periods – from hospital board to area health board (AHB) starting in 1985; and from area health board to Regional Health Authority (RHA)/ Crown Health Enterprise (CHE), starting in 1993. (CCMAU 1996). Even further reforms are likely, if a Labour-led coalition gain power in the 1999 General Elections.

Hospital services in New Zealand were originally funded on a local basis. The form of the modern New Zealand health sector was established in the 1930's when the first Labour government sought to create a publicly funded health service (Barnett and Barnett 1997). The 1938 Social Security Act resulted in central government becoming the main funder and provider of care. Hospitals were financed largely by direct allocation and general practitioner services by a combination of fee-for-services subsidies and patient co-payments. This led to problems of a fragmentation of services, cost shifting between primary and secondary sectors and inequalities in access to care (Barnett and Barnett 1997). In the early 1980's a population-based funding formula for hospital boards was introduced, in part to counter issues of geographic inequity. Further escalation of public hospital spending led to Hospital Boards being reorganised into smaller area health boards in 1985. The premise of these first reforms was to shift the control of hospitals from the regions back to central government. In 1989 public subsidies for private surgery, together with state control

over the location of private surgical beds, were abolished. After the 1990 elections, the incoming National government replaced area health boards with appointed commissioners, and introduced the controversial part-user charges for public hospital services. Over the five years to 1993 employee numbers and bed in service fell significantly, the average length of stay (ASOL) reduced and hospital discharges rose (CCMAU 1996). Although these changes signaled a increase in efficiency, CCMAU (1996) contends that these changes were driven by short term goals, and the emphasis on cost control and reduction appeared to have been on consolidating services, reducing beds as average length of stay declined and closing smaller hospitals.

For hospital services, surgical waiting lists and waiting times are the main indicator of access (Ashton 1999). Access to elective surgery was identified in the reform proposals as an important equity issue and has exhibited significant local variation (Barnett and Barnett 1989). Rationing, by way of a points system, has been introduced to determine who is eligible for treatment. This has been coupled with the replacement of waiting lists by a surgical booking system. The points system effectively has removed 30,000 people from the waiting lists because they are not deemed sick enough to be eligible for publicly funded surgery (Ashton 1999). The reduction in the amount of elective surgery in public hospitals has resulted in a growth in claims against private health insurance.

Like the majority of other OECD countries, New Zealand began to implement more major health reforms. The three major aims of these reforms was to control health care costs (which moved from 52.8% to 68.8% of state spending in the 1984-89 period in New Zealand), improve access to primary and secondary health care, and maintain the quality of health care (Grant *et al.* 1997). These reforms were implemented in 1993 and were based on the integration of public funds for both primary and secondary care into a single purchasing budget. Four Regional Health Authorities (RHA's) were created to purchase all health and disability services from a competing public and private providers. Each Regional Health Authority received a capped budget from the government, based on a population based funding formula. The 14 Area Health Boards were abolished and reconstituted as 23 Crown Health Enterprises (CHE's). The Crown Health Enterprises, while owned by the state, were

expected to operate in a market along with other providers. In 1998, the health and disability services funding structure changed from four Regional Health Authorities, to a Transitional Health Authority and finally to a single Health Funding Authority. This period has marked the transformation of both a regulated health care market into one of considerable degree of market-orientated competition, and the move from a supply-drive allocation system to demand based.

3.3.3 Primary care reforms

The primary care system currently in place creates both geographical and financial barriers to access. As Barnett (1991) demonstrated despite substantial increase in the number of general practitioners since 1980, only modest improvements in maldistribution have occurred. This inequality can be due, in part, to the distribution of GP's by market forces. In 1990 – 1991 high income families in New Zealand spent 2.7 times as much on primary care as did low income families, which is another indicator of inequality (Grant *et al.* 1997). Cost sharing also acts as a barrier. As of 1994 , approximately 54% of the population was entitled to community service cards (CSCs), and over 60,000 people had high use health cards (HUHC) which entitled the user to reduced cost or free health services. Ashton (1999) notes that there has been a poor uptake of community service cards. Removing the financial barrier to primary care should encourage earlier diagnosis and treatment, and a wider use of preventive services. This in turn should reduce the potential for more serious problems that may require hospitalisation at a latter stage.

The 1993 health reforms incorporated a policy of integrating primary and secondary care activities and of giving responsibility for the care to the primary care providers. Brown and Crampton (1997) argue that restructuring of the primary sector has been more difficult as because the government prior to the reorganisation was a subsidiser but not a purchaser of general practitioner services. In response to reforms, GP's have been grouping themselves into independent practitioner associations (IPA's). In 1996 there were 42 IPA's in New Zealand, with the largest one in Christchurch (Pegasus) representing 198 practitioners (Brown and Crampton 1997). Most IPA's are permitted to hold budgets for referred services such as pharmaceuticals, laboratory tests and

community services. Malcolm (1997) estimates that saving have ranged from 8 to 23 percent, primarily through changes in prescribing practices. Another important development in the primary sector has been the establishment of the Pharmaceutical Management Agency (Pharmac), who decide which medicines to include on the subsidy list. The creation of community health centres has also represented a pro-active effort to deal with primary health care problems on low income New Zealanders (Brown and Crampton 1997). These health centres are designed to provide primary care to deprived populations that have inadequate access to health services.

3.4 Why Christchurch?

Christchurch is situated on the east coast of the South Island of New Zealand. Figure 3.4 depicts Christchurch location in relationship to New Zealand. Christchurch is an excellent case study to determine the extent to which hospital admissions can be predicted by variations in neighborhood socio-economic status. Firstly, Christchurch has very little geographical variation - the majority of the population are living on a flat plain without any major geographic barriers to impede access to primary or secondary care. Christchurch has an almost radial pattern that makes public transport favourable. Most of the population is within 400 metres of public transport. Auckland, Wellington and Dunedin on the other hand, have various geographical obstacles that can hinder access – harbours, hills and waterways. Secondly, because of its small industrial base, Christchurch suffers from little environmental degradation. One exception to the "clean and green" image is the increased air pollution in winter. There has been very few epidemiological studies investigating the relationship between air pollution and health effects in Christchurch. Using methodology from British Columbia it is estimated that air pollution in Christchurch could account for up to 29 deaths, and over 80,000 restricted activity days (Foster 1996). Thirdly, Christchurch, as has the rest of New Zealand, experienced an increase in poverty of the last 15 years (Stephens *et al.* 1995, Jamieson 1998). And more importantly, deprivation and hardship are occurring throughout Christchurch, not just in areas traditionally associated with poverty and social disadvantage. Fourthly, Christchurch has a representative mix of different socio-economic groups that make up its population. There is no one dominant group or class. And finally Christchurch has one major hospital, situated near the city centre. This can negate some traditional

problems of access and utilisation, as well as making the recording of hospital admissions easier.

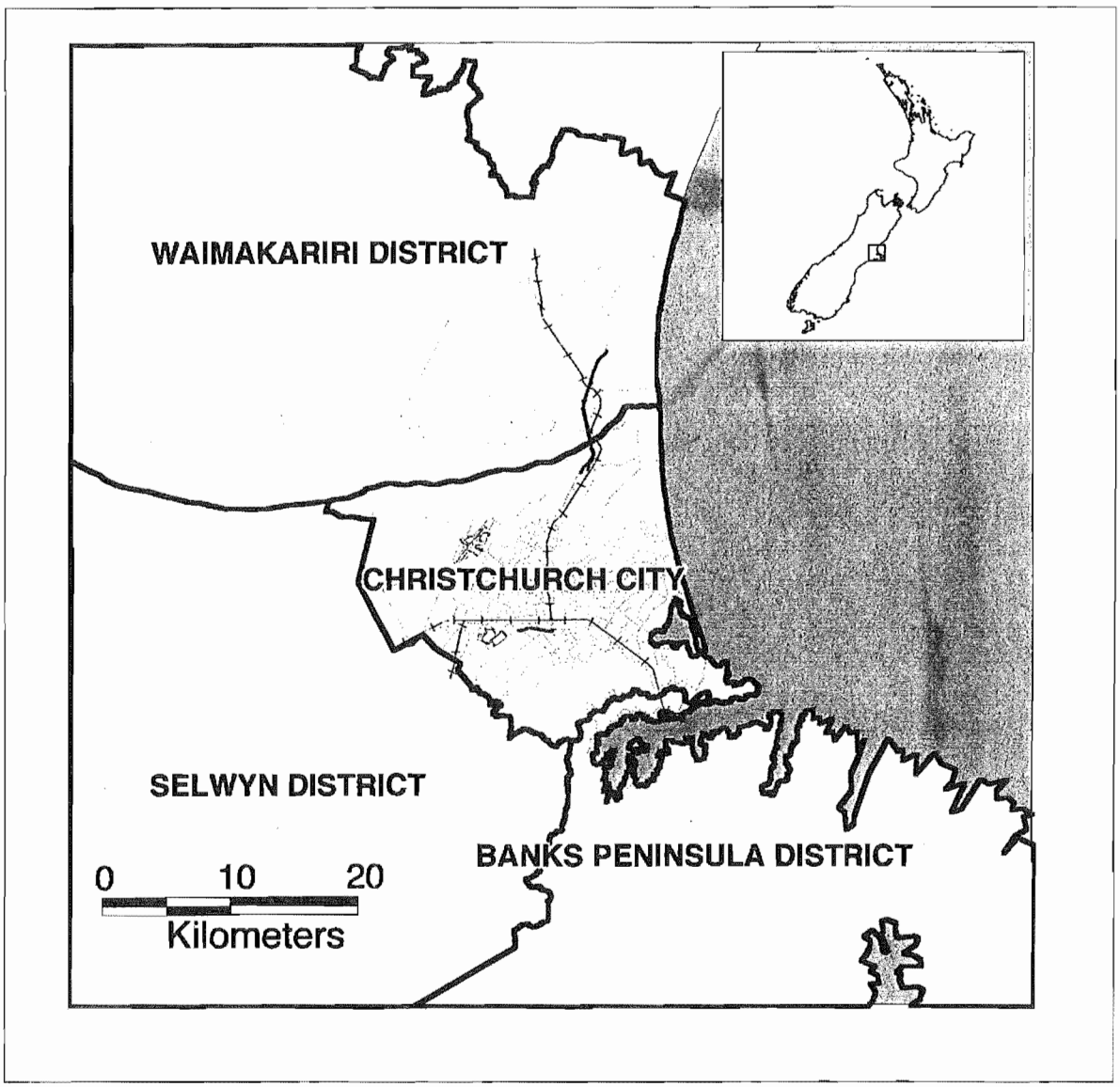


Figure 3.4: Location map of Christchurch

3.5 Summary

This chapter has outlined the political context which has radically changed the environment in which deprivation is formed. Much of the ideology behind these reforms has been the move by the state away from universal welfare to covering those who are considered most in need. This has had far reaching health consequences, especially for lower income groups. Reforms, especially in the housing, income support and health sector have marginalised the lower socio-economic groups to a much greater degree. Recent health statistics paint a poor picture, especially with reference to the lower socio-economic groups and Maori. We have seen the complex interaction of socio-economic factors that make up Maori health statistics. Not only can the Maori poor health status be attributed to social class, but a myriad of other factors, including behavioural and cultural factors. Researchers cannot treat socio-economic status in complete isolation from the structural factors of ethnicity. However, as Wilson (1996) concludes, there is a need for caution when considering the relevance of overseas studies to the New Zealand situation. The reasons include the differences in population density, the mobility of the New Zealand population the unique characteristics of the population, and the fact that New Zealand is less industrialised than the rest of the world.

The present health reforms in New Zealand do not appear to be working. Recent figures released by the Government show that official hospital waiting lists are growing, and that many people are adversely affected by this situation. Those New Zealanders who are unable to afford private health insurance are having to wait for treatment, often with a consequent deterioration in their health and an associated financial and social burden. The issue of health inequality is becoming more politicised, as it effects a greater percentage of the population. In the run up to the general elections this year, political parties are identifying health equality issues as a major policy platform. Furthermore, reports on the growing inequality within the health sector have prompted agencies to investigate further (see for example Jackson *et al.* 1998, Howden-Chapman *et al.* 1998, National Health Committee 1998).

The following chapter introduces the methodology for the Christchurch Case study, and introduces some of the socio-economic indices that are being used in New Zealand.

CHAPTER FOUR

METHODOLOGY

4 Introduction

The previous two chapters have attempted to satisfy the first objective of this thesis – that is to understand and identify the current patterns and processes in health and deprivation, both in a New Zealand context and at an international scale. Chapter Four, therefore, outlines the methodology that will be used to determine the extent to which neighborhood socio-economic status can predict variations in hospital admissions. First, the conceptual framework is illustrated. The second section examines the use of hospital admission data, outlines the procedure in obtaining the hospital admission data, and the procedure in geocoding it to meshblock level. Section Three discusses deprivation indices in use in New Zealand, and describes the NZDep91 and NZDep96 datasets. The fourth section discusses statistical analyses including standardisation, regression and r squared vales which are used in this thesis. The fifth section examines geographic analysis and outlines some of the pitfalls in using geographic data. A brief introduction to Geographic Information System (GIS) is made and a description of GIS datasets used in this thesis is undertaken.

4.1 Conceptual framework

The second objective of this thesis is to determine the extent to which neighborhood socio-economic status can predict variations in hospital admissions. To do this we need to first outline the conceptual framework. This is illustrated in Figure 4.1.

4.2 Public hospital admission data

Deaths among individuals of working age are increasingly rare events, due to the substantial improvement in average life expectancy witnessed in industrialised nations over the past century. The measurement of differential mortality rates among socioeconomic groups in societies such as ours has as Paul (1993:121) argues, become "a blunter instrument" for assessing inequalities in health status. Lundberg (1986) points out that given that not all diseases result in death, the measurement of morbidity may yield qualitatively better information about the health status of

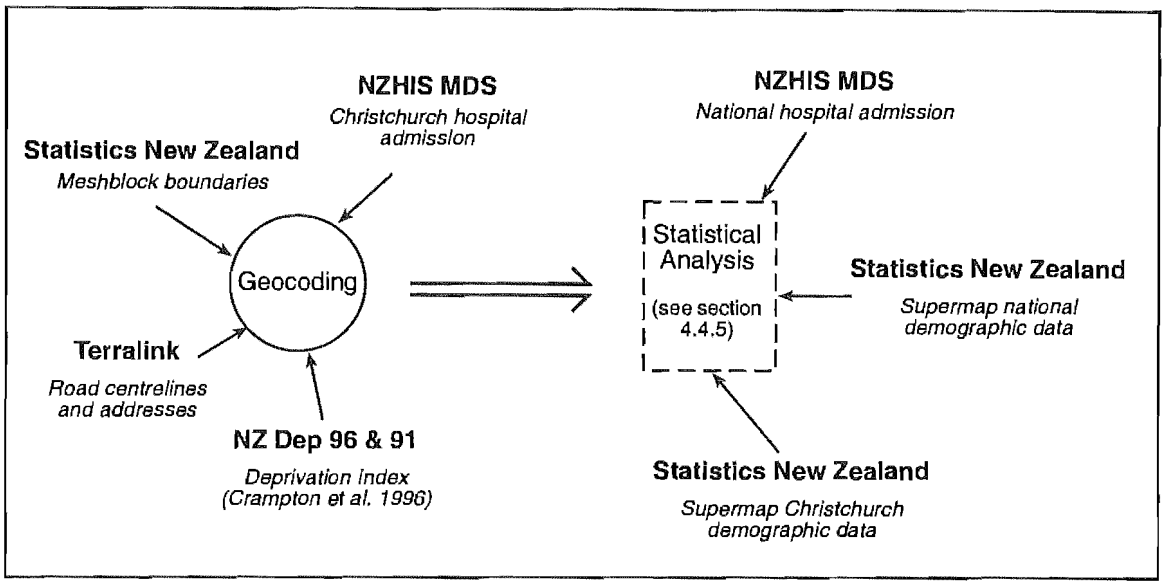


Figure 4.1: Conceptual framework

individuals throughout the life course. This thesis uses hospital admissions as a proxy measure to analyse the extent of illness in a population. However, it is acknowledged that this type of assumption must be made with cautions. A high rate of discharges from a hospital in a locality may be the result of several factors:

- hospital beds in that area being more (or less) available
- general practitioners being more willing to refer people for in-patient hospital care
- the hospital being more likely to accept their referrals
- people being admitted to hospital due to lack of community-based services enabling them to be treated at home or as an outpatient (e.g. rural residents)
- higher rates of illness in the community (which may in turn reflect an older or more disadvantaged population)

Source: Health Funding Authority (1998)

Discharges from hospital generally relate to the more serious end of the spectrum of disease and fails to encompass many aspects of both acute and chronic sickness in the population. Carstairs and Morris (1991) argue that while it is "...thus lacking in comprehensiveness the fact of admission to hospital confers a degree of recognition

of illness which establishes the authenticity of the event..." The authenticity or integrity of hospital discharges is not perfect however since alternative modes of treatment, either by the general practitioner, or as an outpatient, may be appropriate in relation to some episodes of illness. Some patients may also fail to be admitted even when this is necessary, as a consequence of long waiting lists or other resource constraints. The trend towards the use of private medical facilities, which has become more prevalent in recent years, can also affect the accuracy and integrity of admission data.

The actual discharge from a hospital as recorded in a database can also have limitations, as some patients may experience multiple admissions to hospital for one episode of illness while others may have only one admission. Counts of these events in relation to population could therefore prove misleading. Some hospital discharge datasets, such as those supplied by the New Zealand Health Information Service, contain outpatient information, and record multiple admissions through the use of an National Health Index (NHI) code. Thus the rate of hospital admissions cannot be seen as a simple indicator of the health (or ill-health) of a population. Other sources of information need to be employed, such as health surveys, attendance at hospital out-patient, day-patient clinics and general practitioners. It must also be noted that trends in morbidity data may be artifactual, reflecting changes in coding practices (e.g. ICD revision, training of physicians and coders), diagnostic capabilities (e.g. new tests, procedures for assigning diagnoses), and the denominator population (e.g. changing geographic coverage or census inaccuracies) (Lilieufeld and Stolley 1994).

4.2.1 Obtaining discharge data in New Zealand

The National Minimum Dataset (NMD) is a national collection of health data, developed in consultation with health sector representatives and required at national level for policy formulation, performance monitoring, evaluation and research. This data must be reported by all hospitals, including private hospitals as required by law. The Ministry of Health's mandate to collect health information is set out in legislation, in particular, section 22 of the Health Act 1956, section 139A of the Hospitals Act 1957, and the Cancer Registry Act 1993. The collection, storage and

use of health information is also governed by the Privacy Act 1993, the Health Information Privacy Code 1994, and the Accident Insurance Act 1998. The New Zealand Health Information Service (NZHIS) currently manages the national health information systems and standards on behalf of the Crown. As a collector of information the NZHIS has several statutory obligations:

- the need to protect patient confidentiality and privacy
- the need to collect data once, as close to the source as possible, and use it as many times as required to meet different information requirements
- the need for standard data definitions, classifications and coding systems
- the requirement for national health data to include only that data which is used, valued and validated at the local level
- the need for connectivity between health information systems to promote communication and integrity
- the need to address Maori issues

All health and disability service providers, agencies and organisations, as defined in the Health Information Privacy Code 1994, accessing or providing national data, are required to adhere to and comply with national information standards, definitions and guidelines. These include the maintaining the integrity and security of the databases and the transmission or exchange of data between health and disability service organisations which is essential. For the purposes of data collection by the NZHIS, a person is classified as being admitted to a hospital as an inpatient if they stay at a hospital overnight, or for several nights, for treatment or care. They are classified as having been admitted to hospital as a day patient if the stay at a hospital is for more than three hours of treatment, but not overnight.

An application was made to the NZHIS in February of 1999 to obtain a hospital discharge dataset for Christchurch Hospital, for the period 1986 – 1988. The following data was sought:

- Encrypted NHI (unique ID)*
- Age

- Gender
- Ethnicity*
- Address
- Meshblock Code
- Domicile Code (same as Census Area Units)*
- Admission Type (Acute, Waiting List)*
- Admission Date
- Discharge Type
- Discharge Date
- Length of stay
- Diagnosis 01 – 05 (ICD code)
- Procedure 01 – 05 (ICD code)

(* see Appendix One for a complete description of these fields)

The decision to include the "Address" field was made because of the uncertainty surrounding the accuracy of the Meshblock level (statistical units defined by Statistics New Zealand, containing a median of 90 people) and Domicile codes. The NZHIS has implemented a national automated domicile coding (ADC) facility. Providers no longer supply a domicile code, but a comprehensive address must be supplied to allow a domicile code to be assigned. The ADC first scrubs the address into a universal format before assigning a domicile code. If a domicile code cannot be assigned, an error will be reported. In this case the supplier must check the information and if possible provide more complete information. For patients from overseas countries, the domicile code 9999 is used. Upon obtaining the Christchurch Hospital dataset it was found that the geocoding had not been completed correctly, and random samples showed errors of up to 45%. Based on personal communications with several researchers, and experience based on previous utilisation of NZHIS data, errors of up to 60% have been found in miss-classified meshblock and domicile codes Using the addresses it is then possible to geocode individual discharge data into Meshblock or Census Area Units obtaining an accuracy of up to 90%.

Because of the legislation related to the privacy of health information and, in particular, the Privacy Act 1993 and the Health Information Privacy Code 1994, the

NZHIS required approval from both the University Ethics Committee and the Health Funding Authority Canterbury Ethics Board. This was applied for in early March of 1999. The University of Canterbury Ethics Committee granted permission within 3 weeks. The initial application to the Health Funding Authority Canterbury Ethics Board was rejected because.....

> The Committee did not consider that the benefit of the project outweighed the risk of releasing a large amount of identifiable information. Even though the name was not provided, it would be easy to identify individuals within households...
>
> ...It was also concerned that this was not the purpose for which the information was gathered, and therefore, in breach of the Privacy Code.
>
> Received 12 April 1999

Further discussion was held with the Health Funding Authority Canterbury Ethics Board. It was thought that if the NZHIS were able to supply the address only with a unique identifier this could then be geocoded to meshblock level. Then the data could be sent back to the NZHIS, the 'corrected' meshblocks added to the dataset, and the complete dataset sent back. The NZHIS advised that this was possible. On the 25th of May, the Health Funding Authority Canterbury Ethics Board gave provisional approval, based on the NZHIS providing the information as indicated above. NZHIS provided the required dataset on CD-ROM in early June.

4.2.2 Geocoding the admission dataset

The author proceeded to geocode the 170,000 record database using a Filemaker Pro database, Microsoft Excel and MapInfo. This operation took much longer than expected as the quality of the data in the address field was very poor. To geocode an address a 'clean' address field is required – such as in the form of <street number> <street name> <suburb> <city or town>. Any alteration to this format requires the user to reformat that particular field. In the dataset supplied by the NZHIS, it was found that nearly 70% of the address fields would needed to be modified in some way. The most common problems were as follows:

- Insufficient address information (i.e. town or suburb missing)
- Flat or unit in address field (i.e. should be street address only)
- Spelling mistakes
- Listing of Rest Home or hospitals in address field
- Elements switched around (street address in suburb field etc.)
- Use of care of (c/o, c/- etc.) in address field
- Variants of town names (i.e. INGILL for Invercargill)
- Use of RD (Rural delivery) addresses

Apart from the use of Rural Delivery addresses, all the above errors can be attributed to human error. In accord with NZHIS (1999) requirements data for the inpatient event database is required to be supplied error free, in the appropriate coded format. Additionally all publicly funded health and disability service providers are required to meet data reporting and quality requirements. To overcome coding problems, the New Zealand Health Information Service has run extensive training courses for coders. Whilst it is acknowledged there are still coding deficiency problems in various hospitals, the incidence is decreasing and the Ministry of Health considered that such should not be used as an impediment to the publication of results.

The author wrote a small script in Filemaker Pro that attempted to clean up the most obvious errors including the use of 'care of', variants in names and the use of flats or units in addresses. After running several modifications of this script it was found that over 90,000 records still had errors that needed manual correction. Due to time constraints, it was decided to attempt to geocode only the records that indicated a Christchurch or Mid-Canterbury address (approximately 135,000 records). These records were exported from the Filemaker Pro database into two Microsoft Excel spreadsheets (as Microsoft Excel can only contain 77,000 records). Using the 'filter' and 'sort' commands each spreadsheet was manually corrected. Several steps were taken as described below:

- Christchurch street names were compared with the Terralink street database to correct spelling mistakes and errors
- Resthome, hospital and other names were changed to street addresses

- Mid-Canterbury addresses (between the Rakaia and Ashley rivers) were assigned domicile codes
- Other errors were corrected as necessary

The sheer number of initial corrections required over 80 hours of computer time. Once completed this data was imported into MapInfo, a Geographic Information System. A geocoding dataset was obtained from Terralink in Arc/Info format and converted to MapInfo. Geocoding was first tried using the 'automatic' process – MapInfo attempts to geocode the data without user input. This had a success rate of only about 16% mainly because the geocoding database did not contain all the street address numbers and street names. The Terralink database was over 3 years old and was known to be incomplete. At the time of geocoding this was the only geocoding database available to the Department of Geography at the University of Canterbury. In August the author trailed a new updated geocoding database from Critchlow Associates, and achieved a success rate of 60%. However, the MapInfo software experienced some confusion with certain street suffixes like Street, Road, Avenue. Typical of this error was a road named "The Esplanade". MapInfo looked for a regular suffix, and unable to find one, gave the record an error code. As a further example a road named "Main Road North" was misinterpreted because of the irregular suffix 'North'. However, the address data was eventually geocoded using the 'interactive' option, where the user selects from a list of options. Approximately 20 hours of computer time was required the geocoding to with an eventual success rate of 94%.

The next step was to assign meshblock ID's to each record using the 'Update column' option in MapInfo. This is achieved by adding a meshblock boundary layer to the geocoded records enabling the meshblock ID to attach to all records falling within that boundary. The records were then exported to a Microsoft Access Database, the address fields deleted, and the database burnt to a CD-ROM which was couriered to NZHIS in early July. The NZHIS attached the rest of the fields to the geocoded records and returned the database to the author on the 8th of August. A subsequent check found that the date of admission, discharge and length of stay fields had not been added. The database was returned to the NZHIS once more, for the missing

fields to be attached, and eventually the author obtained a complete NZHIS Discharge dataset relating to Christchurch Hospital on the 17th of August – over 6 months after first making an application!

4.3 New Zealand socio-economic datasets

It has been argued by Dutton and Levine (1989) that in the case of health research, it does not matter whether socio-economic status is measured by income, education, or occupation, much the same picture emerges - those at the bottom generally have the highest rates of death and disease. This section discusses the use of socio-economic indexes in New Zealand and there suitability for use as measure of health. First a discussion of area-based indices are made, with particular reference to the NZDep91 and NZDep96 indices. And secondly, a review is made of other socio-economic indexes in use in New Zealand.

4.3.1 Measuring area-based deprivation

To obtain composite measures of deprivation it is usual to take a set of socio-demographic variables for a defined population (usually derived from census datasets), and transform them using statistical techniques to obtain indices of deprivation (Crampton *et al.* 1997a). Morris and Carstairs (1991) submit that composite indexes like the NZDep and HEQ indices have an attraction as they are based on a number of facets of deprivation, and are therefore less susceptible to instability caused by a rapid change in any one variable. There is however ongoing debate about the selection of these variables and the methods of aggregation. Of more current concern is the so-called 'ecological fallacy' (discussed in further detail in section 4.4.1). NZDep96 and the HEQ are using the average characteristics of an area to classify individuals. This may result in many individuals being mis-classified. They may be living in an area of apparently greater wealth than their individual status would justify, or living in an area where their individual status would impart a higher socio-economic ranking. Notwithstanding this potential for misclassification, when working with large data sets, like the hospital discharge data, the area classifications can provide a powerful proxy for individual socio-economic status. The one

overwhelming benefit of employing an area approach is the opportunity offered to examine a wide range of records which are based on individual events and contain statistical boundary references. This can overcome one of the major limitations of the traditional social class basis as individual social class information is not available with most health records.

4.3.2 The New Zealand Deprivation Index

The New Zealand Deprivation Index 1991 (NZDep91) reflect aspects of material and social deprivation via a mathematical technique called principal component analysis. These are calculated at a Meshblock level which are then able to be aggregated to larger units. The score is scaled to give a New Zealand average of 1000, with a standard deviation of 100 index points. In general one uses deciles - tenths of the population, where 1 represents least deprived areas and 10 most deprived areas. The reader is directed to Crampton *et al.* (1997a) for a full description of the NZDep91 Index.

The variables for NZDep91 are:

Income	People in households with equivalised income below a threshold
Income	People aged 18-59 receiving a means-tested benefit
Transport	Adults with no access to a car
Living space	People in households with equivalised occupancy above a threshold
Owned home	Not living in own home
Employment	Unemployed and aged 18- 59
Education	People aged 18-59 without any qualifications
Support	Single parent family
Support	Separated or divorced and aged 18 – 59
Support	Separated or divorced and aged 60 plus

The New Zealand Deprivation Index 1996 (NZDep96) is an updated version of the NZDep91 index. It combines nine census variables from the 1996 Census. The variables for NZDep96 are:

Communication	People with no access to a telephone
Income	People aged 18-59 receiving a means-tested benefit
Employment	People aged 18-59 unemployed
Income	People in households with equivalised income below a threshold
Transport	People with no access to a car
Support	People aged <60 living in a single parent family
Education	People aged 18-59 without any qualifications
Housing	People not living in own home
Living space	People in households with equivalised occupancy above a threshold

For simplicity sake, deprivation will be classified in two ways, as illustrated in Table 4.1. Figure 4.2 illustrates the NZDep 96 deciles at meshblock level in Christchurch.

Table 4.1: Classification of NZDep deciles and socio-economic class

NZ Dep decile	1	2	3	4	5	6	7	8	9	10
Socio-economic group	Very high		High		Medium		Low		Very Low	

One of the aims of this thesis is to show how deprivation had changed in Christchurch between 1991 and 1996. It was thought that the NZDep91 and NZDep96 indexes would make a good comparison. The two indexes were compared using Microsoft Excel and some surprising results were recorded. Firstly, a comparison showed that deprivation had actually *decreased*, and that the most deprived 30% had in fact become less deprived, while the less deprived 30% had become more deprived. This went against all anecdotal and qualitative research undertaken (see for example Jamieson 1998, Stephens *et al.* 1995 and Stephens 1994). These result are illustrated in Figure 4.3.

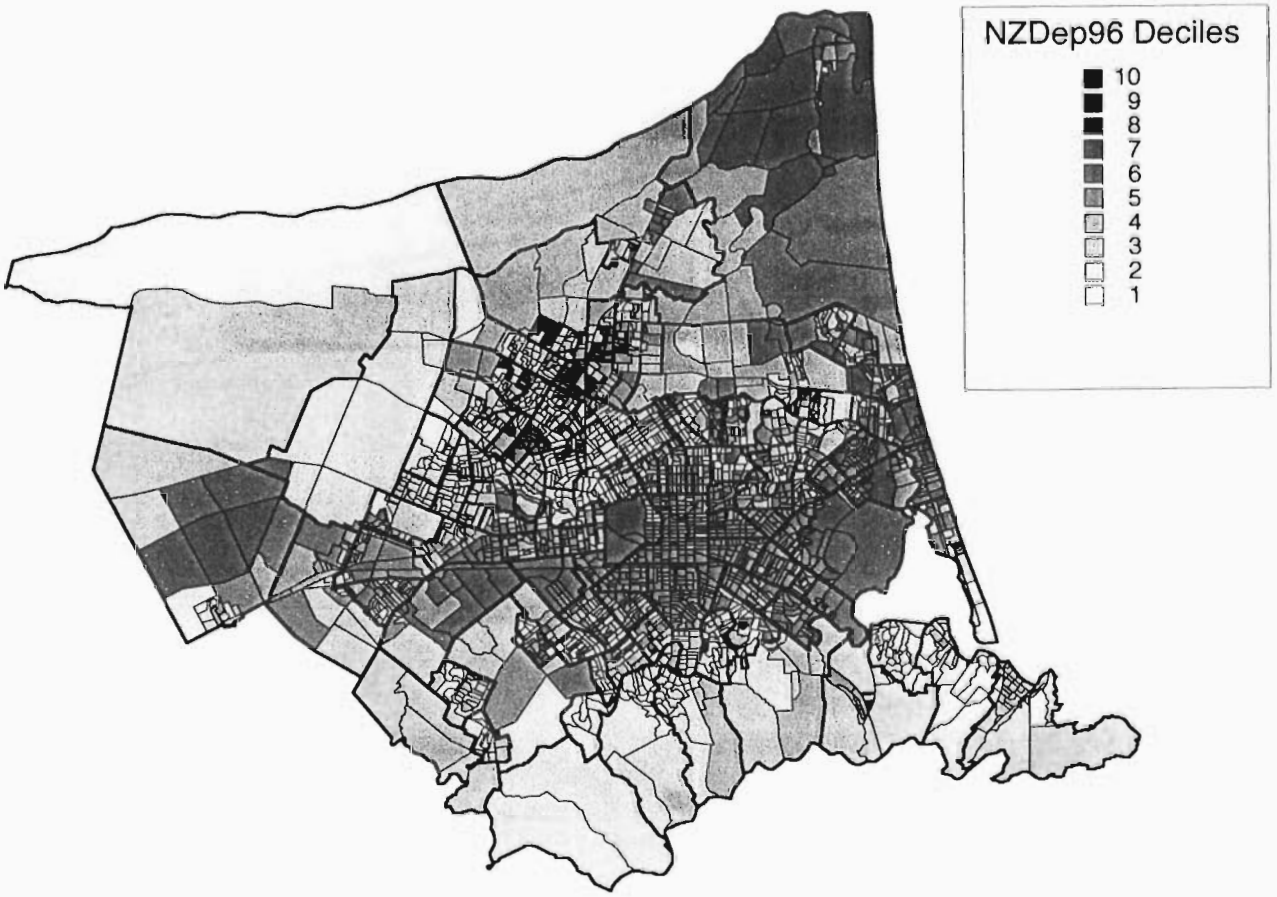
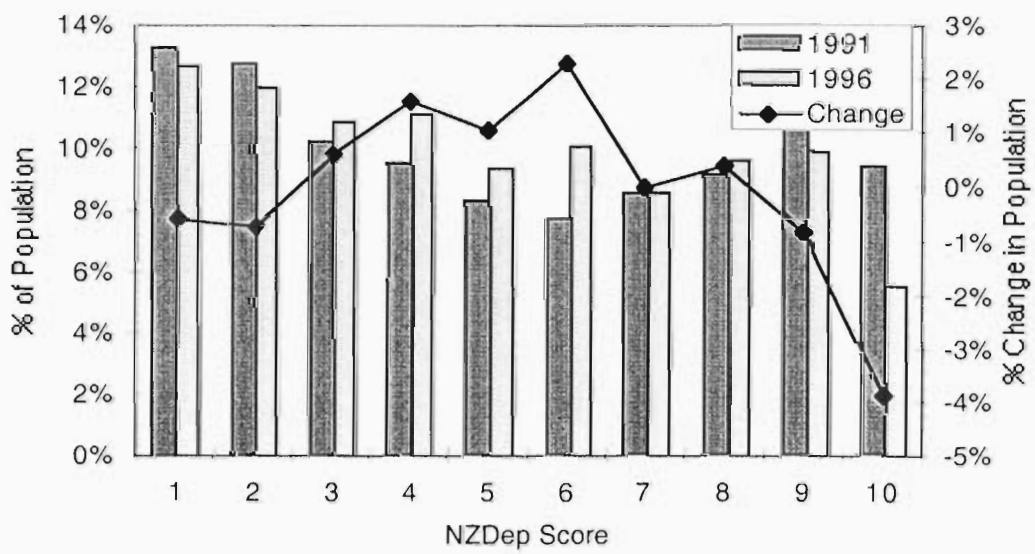


Figure 4.2: NZDep96 deciles in Christchurch



Source: Crampton *et al.* 1996

Figure 4.3: Comparison of deprivation, NZDep 91 and NZDep 96, Christchurch

There are several problems associated with analytical determinations of trends in deprivation conducted in this way. As the deprivation index applies to all New Zealand, deprivation in Christchurch is measured relative to all areas in New Zealand. Conceptually, longitudinal analyses using NZDep91 and NZDep96 can be difficult. First, the construction of the two indices had changed due to the dropping of two variables (both based on marital status), and the insertion of one new variable (telephones). Hence, direct comparisons of deprivation from census to census must be qualified by an understanding that the measure has changed. Second, the deprivation indices give a ranking of all areas in New Zealand at a given point in time. It is not possible to measure the 'absolute' deprivation of an area, and compare changes over time. It is possible, however, to measure change in the ranking of an area (i.e. its position relative to all other areas in NZ) (personal communication Peter Crampton).

Another factor that may have contributed to the unexpected result was the change some of the variables due to recent state reforms. For example, one of the variables in NZDep96, measures the percentage of people aged 18-59 receiving a means-tested benefit. Statistics show the number of people on means-tested benefits has reduced as government welfare reforms limit the effectiveness of, or deny potential clients access to, targeted supplementary assistance (Le Heron *et al.* 1996). It was decided to measure the change in deprivation relative to all other areas in New Zealand.

Previous studies have aggregated the NZDep91 and 96 data to Census Area Units (Jackson *et al.* 1998, Jackson 1999). This can be problematic as the aggregation can create a false picture. Many of Christchurch's CAU's contain a wide spread of deprivation deciles. To obtain a deprivation score for each CAU, a weighted average was taken of the meshblocks contained within the CAU. Appendix Two displays a map of CAU's in Christchurch, Appendix Three shows a table with CAU deprivation scores, and Appendix Four displays a table of CAU's with there component populations by deprivation decile. Figure 4.4 shows the CAU boundaries of the Christchurch with a weighted average deprivation score. The background consists of meshblocks colour coded to their deprivation decile score. Inset B in Figure 4.4 shows a sample of several CAU's with a wide variety of meshblocks within them. This is to illustrate the problem of aggregating to CAU level.

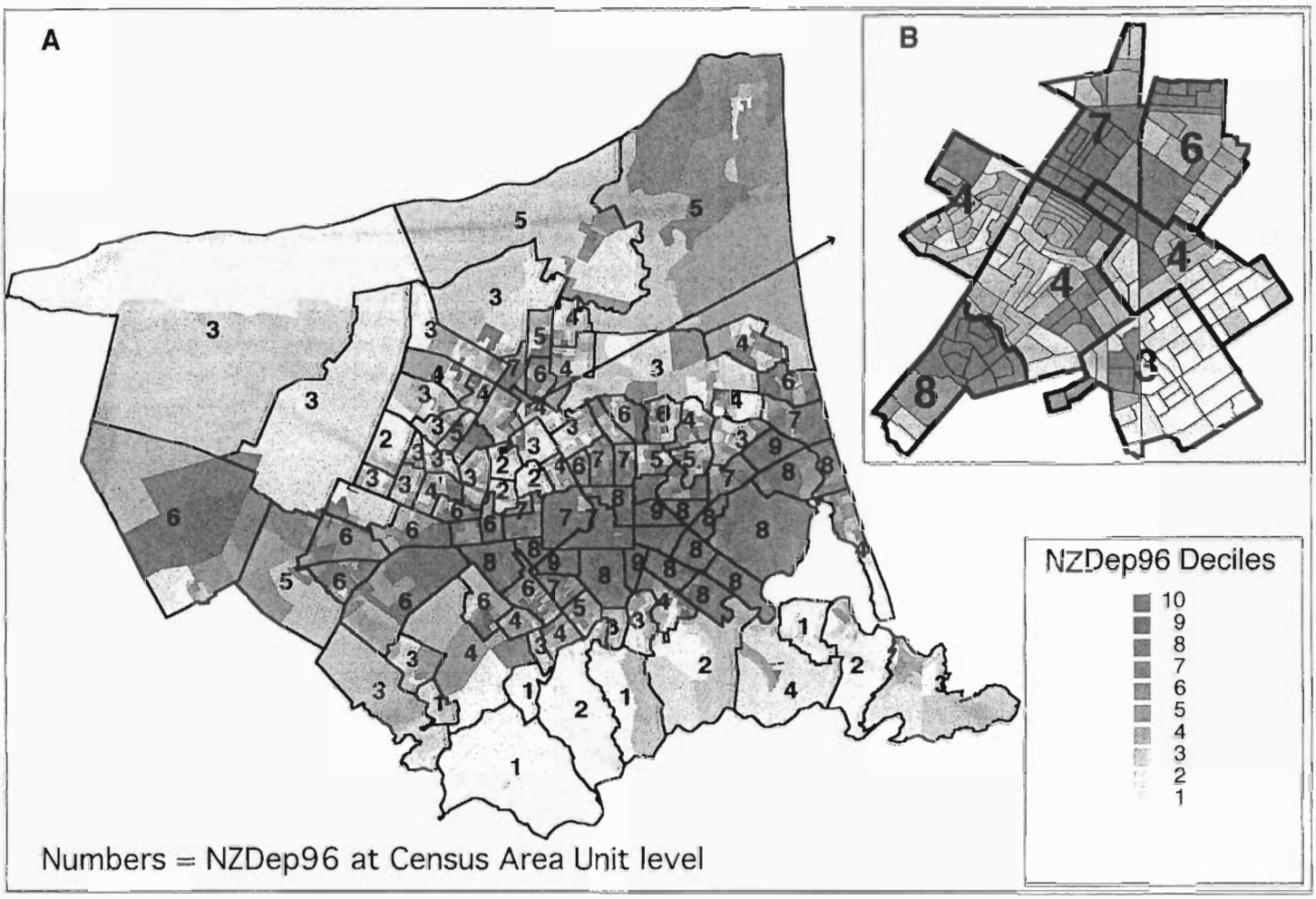


Figure 4.4: Comparison of meshblock and census area unit deprivation values

4.3.3 HEQ dataset

The Health and Equity Quotient (HEQ) is a commonly used measure of social advantage/disadvantage in the health sector. The Health and Equity Quotient is made up of variables taken from census information about each Census Area Unit (CAU). The HEQ score correlates closely with results that can be obtained from using the NZDep91 score, which is also based on similar census variables (Kokaua 1997). As the majority of admissions data had been geocoded to meshblock level, and as another deprivation dataset at meshblock level was made available, the HEQ index will be

used for comparison only. Figure 4.5 illustrates the HEQ index for Christchurch and Appendix Three shows the HEQ values for each Christchurch CAU.

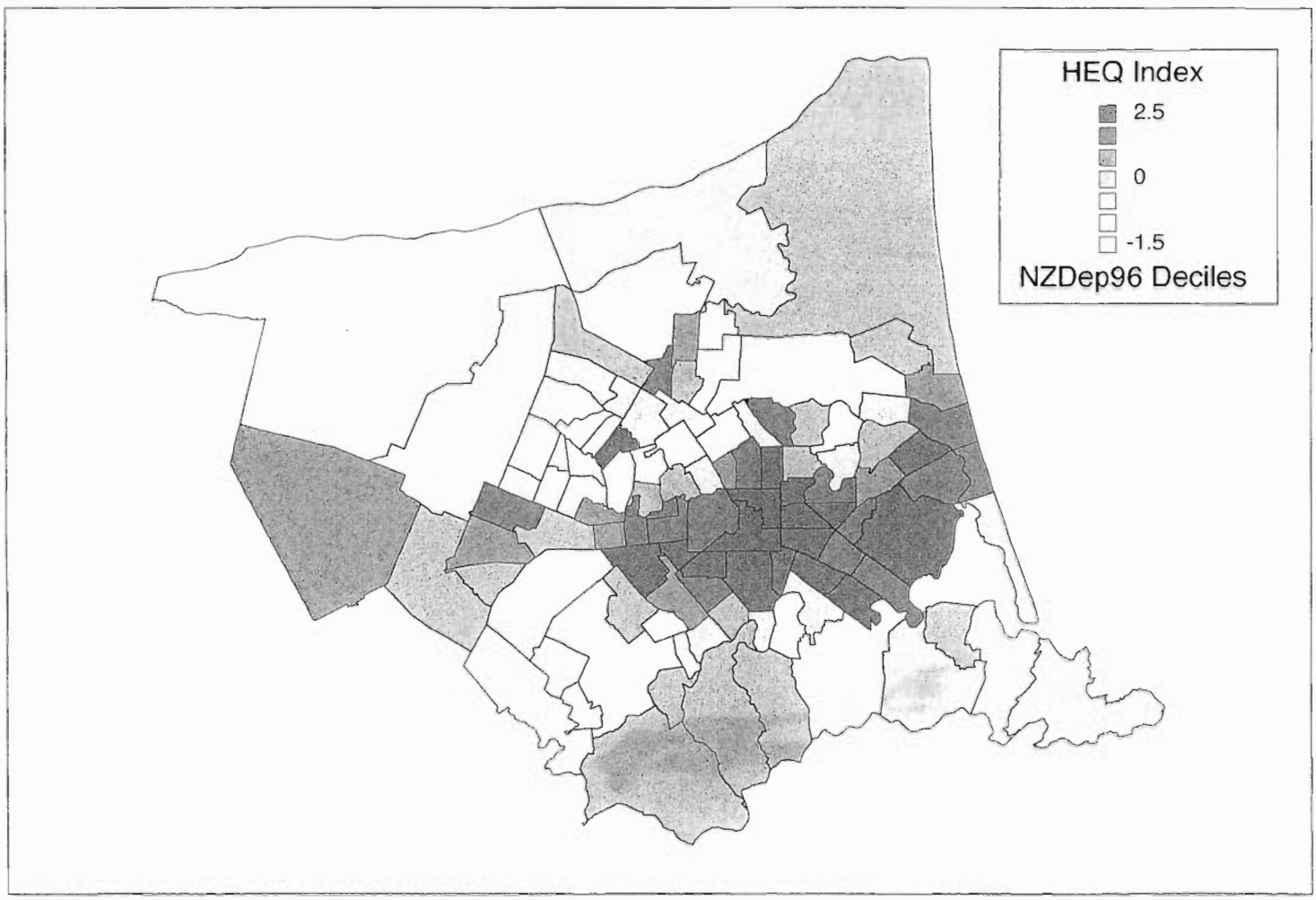


Figure 4.5: HEQ index, Christchurch

4.3.4 Other socio-economic indexes

Prior to the development of the HEQ index, Salmond *et al.* (1980) undertook an index of 'relative sufficiency' to explore community attitudes to sickness and health in Porirua in 1980. Midland Health had also developed a "Midland Health Index of Relative Disadvantage' (Kokaua 1993) and applied this to sub-regions within the Regional Health Authority region. It was considered that sub-regions shown to have relative social and economic disadvantage also appear to have poorer health status, represented by higher hospital utilisation and poorer life expectancy.

Several other indices have been used in relation to determining socio-economic status – the most common being the Elley-Irving scale and New Zealand Socioeconomic Index of Occupational Status. These differ to the indices discussed above as they are not area-based – but rather occupation based. As the NZHIS MDS dataset does not contain accurate information on occupation, the use of these indices was not practical.

The Elley-Irving scale is used to classify men into different socio-economic groups. In this scale, occupations are classified into six levels using an equal weighting of median income and median educational attainment. The Elley-Irving social class 1 consists mainly of professional, technical and related workers, while social class 6 consists of unskilled manual workers (Elley and Irving 1974). The scale has come under some criticism. First, it excludes woman, who are becoming a larger part of the work force. Second, it has been criticised for the arbitrary assignation of equal weights to education and income levels (Marshall *et al.* 1993).

The New Zealand Socioeconomic Index of Occupational Status (NZSEI) is modeled on the International Socioeconomic Index (ISEI) devised by Ganzeboom *et al.* (1996). The Index is developed using a statistical formulation of the relationship between education, occupation and income. The additional variable of age confounds the relationships observed between education, occupation and income, and is therefore also explicitly introduced into the equation. Each occupational group is thus allocated a score on the continuous NZSEI scale from 10 to 90, for consistency with the international index. Data drawn from the 1991 Census is used in the construction of

of the NZSEI, and the model is initially applied to all full-time workers aged between 21 and 69. The continuous NZSEI scale is broken down into six 'occupational class' categories. In general, the health indicators are shown to conform to expected socioeconomic patterns when plotted against the six NZSEI categories, thereby demonstrating the NZSEI to be a valid socio-economic indicator. However, unexpectedly high scores on the health indicators for the lowest NZSEI category suggest that the placement of farmers within this category is problematic. It seems likely that the NZSEI provides a more accurate measure of socioeconomic status for urban sample populations (Davis *et al.* 1996).

4.4 Statistical analysis

Lies, lies and damned statistics as Winston Churchill once complained. As with any quantitative study it is desirable to be able to analyse your data in a way that can determine the accuracy of the research. As Altman (1982) has argued, bad statistics leads to bad research and bad research is unethical This section has two purposes; first to discusses the use of crude rates, age standardisation and the use of regression; and secondly to outline the statistical framework employed in this thesis.

4.4.1 Crude rates and age standardisation

A crude, or "unadjusted", rate (CR) is a measure of the actual morbidity experience of the population under study (i.e. the "population-at-risk"). It is calculated by dividing the total number of deaths or cases (i.e., the numerator) in the study population, by the total population-at-risk or person-years-at-risk (i.e., the denominator) and expressed as a unit of the population (e.g., per 1,000 population).

$$\text{CR (per 1,000 population)} = \frac{\sum n_i}{\sum p_i} \times 1000 \text{ (the constant or unit of population)}$$

Where:

n_i = the total number of deaths or cases (numerator) in age group i per annum

p_i = the total population (denominator) in age group i

The crude rate can be influenced by the distribution of the population-at-risk (or denominator). This can be either age or gender based. As the rate of many diseases increases with age the crude rate for groups with higher proportions of older people can be higher than groups with higher proportions of younger people (Borman 1995).

An age-specific rate (ASR) is the rate at which a particular health event occurs in each age group of a population, expressed as some unit of the population-at-risk or person-years-at-risk. Put simply the age-specific rate is simply the crude rate for the specific age group. For example, to calculate the age-specific rate of a disease for people aged 45 to 49 the total number of cases in the age group is divided by the population in that age group and multiplied by a constant (a unit of population, such as 1,000 or 100,000).

$$\text{ASR per 1000 population} = \frac{n_i}{p_i} \times 1000 \text{ (constant)}$$

Where:

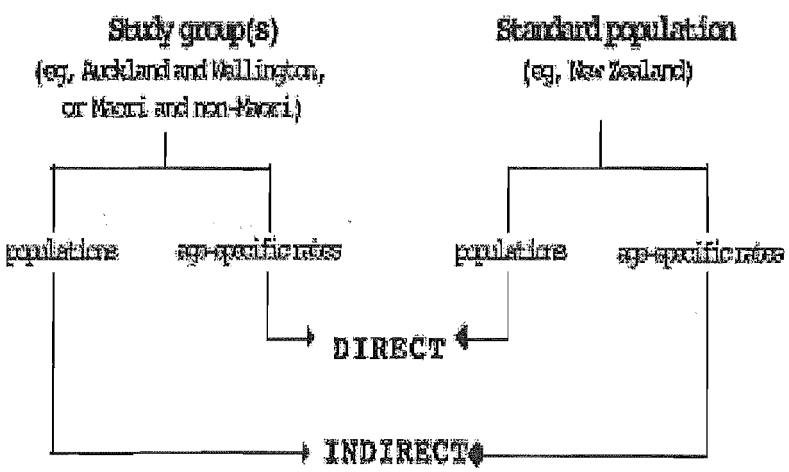
n_i = the number of deaths or cases (numerator) in age group i per annum

p_i = the total population (denominator) in age group i

If there are small numbers of cases or deaths (numerator) or a small population (denominator) in some age groups, any age-specific rates that are calculated may be too imprecise and unreliable for use in detailed comparisons. For example, two deaths in a population of 25 will produce an age-specific rate of 80.0 per 1,000. One extra death would increase the rate to 120.0 per 1,000. In a population of 5,000 people there would have to be 400 deaths to produce a rate of 80.0, but 200 extra deaths would be needed to increase the rates to 120.0 per 1,000 (Borman 1995).

As has been described comparing crude rates can lead to erroneous conclusions being drawn about the impact of a health event in a population. An age-specific rate is a measure of the disease or death in an age group, but it can be unreliable or imprecise if the numerator or denominator is small. Comparing the age-specific rates of two (or more) study populations can be difficult if there are a large number of age groups involved. For example, comparing five-year age-specific rates for Maori, Pacific

Islands people, and "Others" involves making 54 comparisons (i.e. 18 age groups and three ethnic groups). It is, therefore, more convenient to compare the mortality or morbidity in study groups using a summary index which takes into account differences in the age distribution of the compared groups. In analysing health data two methods of standardisation (direct and indirect) are commonly distinguished, but only one process is involved – age-specific rates are weighted by a population in specific age groups. The difference between direct and indirect standardisation is the source of the population (or weights) and the age-specific rates as shown in Figure 4.6.



Source: Borman 1995

Figure 4.6 : Comparison of direct and indirect standardisation

4.4.2 Direct standardisation

Direct standardisation assumes that the distribution of the population in the various age groups of the studied group(s) is the same as that in a standard population. Specifically it asks how many deaths or cases would have occurred in the study group if it had an identical age structure to some standard population, but the age-specific rates remained the same. This may be described as:

$$\frac{\sum P_i r_i}{\sum P_i} \times \text{constant (unit of population)}$$

Where:

r_i = the rate in age group i of the study population

p_i = the population (denominator) in age group i of the standard population

Borman (1995) notes several issues with direct standardisation;

- Study populations with the same age-specific rates have the same directly standardised rates.
- Consistent inequalities between age-specific rates will produce directly standardised rates with the same inequalities.
- The distribution of the standard population should not be markedly different from the study populations being compared.
- Low numbers in the numerators or denominators (especially zeros) of some age groups are likely to produce unreliable age-specific rates.

4.4.3 Indirect standardisation

The basis for using indirect age-standardisation is to find out how many deaths or cases would have occurred in the study group if the age-specific rates of some standard populations were applied to the population of the study group. The age-specific rates of some standard populations are weighted by the population in the equivalent age group of the study group. This contrasts with direct standardisation where the age-specific rates of a study group are weighted by a standard population. Indirect standardisation is used when age-specific rates in the study group(s) cannot be calculated and when there are very small denominators (populations) in the age groups of the study group. The result of indirect standardisation is usually given as a standardised mortality ratio (SMR) if the outcome of the study is death. If the outcome is morbidity (e.g. people with a condition) this index can be labelled a standardised morbidity ratio. Both indices are the ratios of the actual (or observed) number of deaths in a study population to the expected number of deaths given the standard age-specific rates. By convention 100 is used as the constant and the standard against which individual SMR's are compared. The SMR for a standard population (which provided the age-specific rates) will always be 100 as the observed and expected numbers will be equal. This may be described as:

$$\frac{\sum n_i}{\sum p_i R_i} \times 100$$

Where:

n_i = the number of cases in age group i of the study group

p_i = the population in age group i of the study group

R_i = the rate in age group i of the standard group

Borman (1995) notes that a SMR for a study group should only be compared to the standard (100) and not with the SMR for another study group.

The indirect age standardisation of rates (with the internal standard being the whole population) is the most common method of standardisation used in mortality and morbidity atlases (Walter and Birnie 1991). This method has been considered to be particularly appropriate when even frequencies are small because directly adjusted rates are unstable in such situations. However, the direct age standardisation of rates is considered to be generally more reliable, according to a recent study which compared the two methods (Pickle and White 1995). This thesis uses direct standardisation as the comparative measure for hospital admissions.

4.4.4 Regression

Regression is a method of estimating the numerical relationship between variables so that a particular variable can be predicted from one or more of other variables. It is usually displayed as:

$$Y = a + bX$$

Where:

a = intercept of Y when X is 0

b = change in y with each increase in x

Due to a bug In Microsoft Excel 98 for the Macintosh all regression equations used in this thesis will be shown as:

$$Y = bX + a$$

In this thesis regression analysis will be used to examine the difference between rates of admission over different time periods and deprivation levels. The *b* value will tell us the rate at which the admissions are increasing (or decreasing) over each time or deprivation period increase.

The r^2 value is a dimensionless index that reflects the extent of a linear relationship between two datasets. The r^2 value can be interpreted as the proportion of variance in Y attributable to the variance in X. The r^2 value can range in value from –1 to 1. Zero signifies that there is no relationship (i.e. a 100% variance between the variables X and Y). The closer the r^2 value is to –1 or 1, the more significant the relationship is. A positive value indicates a positive relationship, while a negative value indicates a negative relationship. In this thesis the r^2 value will be used to validate the relationship between hospital admissions and time or deprivation.

4.4.5 Statistical framework

The admission dataset was exported from Microsoft Access into Microsoft Excel. As Excel can only handle 77,000 records, the dataset was first divided into separate files, with each file representing a one year period (Jan – Dec). Each record in each file was then coded for the following variables; day-patient and in-patient, Christchurch resident, admission type, disease type, age group and deprivation decile. Then the statistical analysis was undertaken on each set of data. Direct age standardisation using the Christchurch populations was undertaken for deprivation deciles and age groups. Figure 4.7 illustrates the steps taken in coding each file.

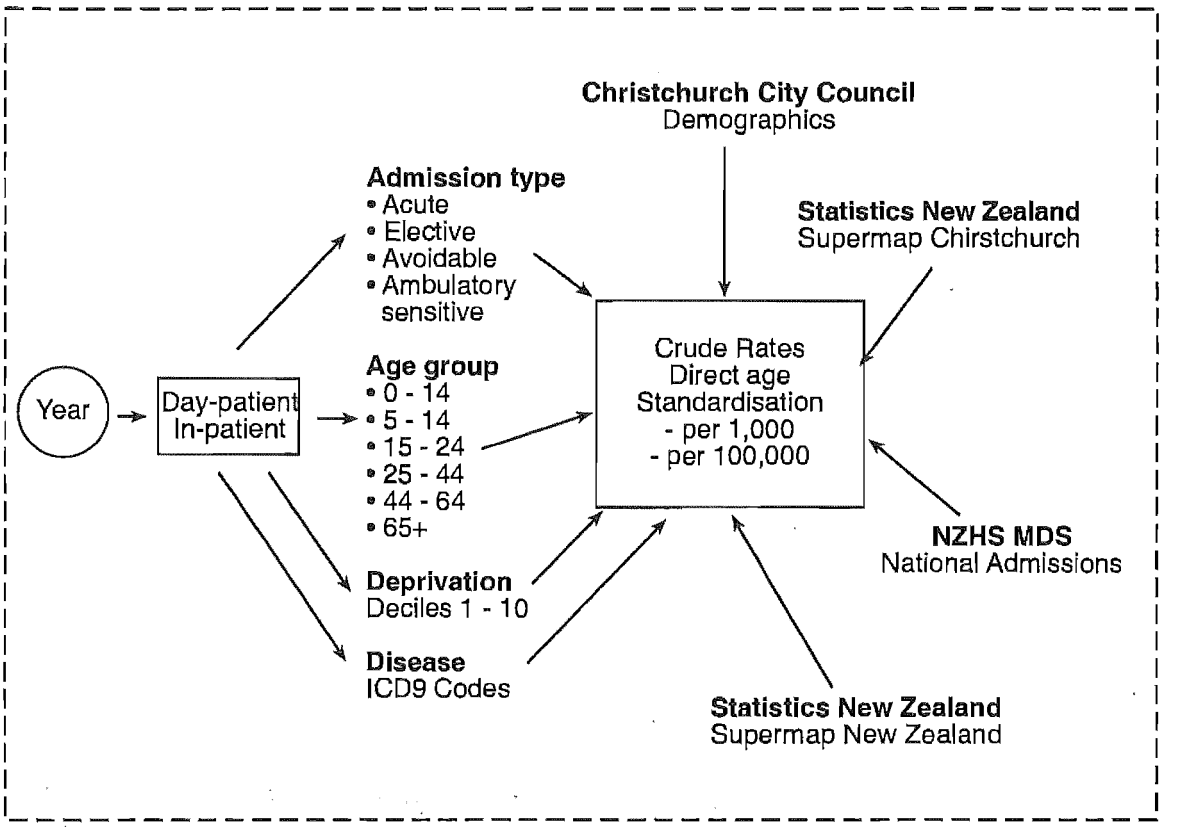


Figure 4.7: Statistical framework

Direct age standardisation was employed using total resident Christchurch populations (by age group and deprivation).

4.5 Geographic analysis

This section examines some methodological issues that must be considered when analysing spatial data. In particular the issue of the ecological fallacy and the use of small numbers is discussed, place of resident misclassification and multi-level modeling.

4.5.1 Ecological Fallacy and the use of small numbers

There is concern expressed in the literature on spatial analysis, regarding such limitations as the *ecological fallacy* or *ecological bias* (Greenland and Morgenstern 1989). This refers to the problem of confusing the group with the individual members

of that group. That is, of assuming that because a group has a certain characteristic, all the members of that group has that characteristic, The 'ecological fallacy;' is actually a form of cross-level bias that can go both ways when studying individuals and groups (Wilson *et al.* 1996). While such cross-level bias needs to be considered, Suser (1994) contends that it is important not to misplace concern regarding the importance of the ecological fallacy, especially considering that exposure at the group level (e.g. passive smoking or communicable disease spread in a community) can have an affect on health status. Furthermore, many public health interventions are directed at the community, as opposed to the individual, level (Wilson *et al.* 1996).

Variation in morbidity and mortality rates can be distorted when small numbers are involved. Small numbers can be avoided buy aggregating events over a number of years (while taking into consideration that fact that characteristics of the areas may change over time) or the area size can be increased, for example by combining groups of small areas (Wilson *et al.* 1996). Other more elaborate statistical techniques are available. Monte Carlo simulation has been used successfully with US hospital mortality data (Flanders *et al.* 1994) and the New Zealand asthma rates (SIRC 1998). Cressie (1993) has described the benefits of using an empirical Bayers approach to improve the validity of incidence rates by filtering out location error and measurements error. This type of approach have been used in New Zealand to deal with unstable rates for child mortality (Marshall 1991).

4.5.2 Residence misclassification

Residence misclassification in spatial analysis may occur for several reasons. Wilson *et al.* (1996) gives two examples; Pacific Island people who come to New Zealand for specialist medical treatment may give the address of a relative they are staying with rather than identifying themselves as normally resident overseas; and locality-based suicide data where suicides in an area might be associated with the presence of a large psychiatric hospital in that area. Another potential problem is seen where large institutions like resthomes, prisons, and suchlike are not accounted for in the five yearly censuses. Populations can move to and from these areas and distort resident population figures. A specific example in Christchurch is the Templeton CAU which

contains a large psychiatric hospital, a residential care center for the intellectually handicapped, and two prisons. Particular problems can arise with nursing home patients admitted across area boundaries for long-term care. Persons may seek care in urban locations because of greater availability of services and facilities, than in rural locations. A specific limitation with the census data used for denominator populations are that it excludes temporary visitors from elsewhere in New Zealand and overseas and it does not include local residents who were overseas at the time of the census. Furthermore, these data may become somewhat out of date during the five-year period between censuses. As seen in Chapter Six and Appendix Three admission rates for this and some other CAU's are not consistent with what would be expected.

4.5.3 Multi-level modelling

Multi-level modelling is a technique that can allow for the analysis of health information at multiple levels (e.g. regional, district and individual) simultaneously while still being able to distinguish these separate dimensions (Wilson *et al.* 1996). For example, a UK study used multi-level modelling to establish the magnitude of regional differences in mortality rates, independent of social deprivation (Langford and Bentham 1996). It examined mortality rates in areas cross-tabulated by region, area type and levels of socioeconomic deprivation. Leyland (1996) analysised admission rates with the intention of separating the effects of area of residence from the effect of the hospital themselves. Another example is the application of this technique to regional variations in health-related behaviours such as smoking and drinking (Duncan *et al.* 1993).

4.5.4 Geographic Information Systems and spatial information applications

The most common Geographic Information System in use in New Zealand is Supermap, which has been developed the Statistics New Zealand. Developed by Space-Time research, Supermap allows the user to analyse 1Gb of demographic data for the entire country, at a resolution scale of meshblocks and up. This data can be mapped directly, or exported into Excel or many other statistical or Geographic Information Systems applications. Maps can be overlain with digitised topographical features, such as lakes, coastline, national roads, and urban roads in the major centres.

The graphic software is not just limited to maps; charts such as scatterplots, pies and histograms are also easily generated from the raw data and their statistical derivatives such as means, modes, and standard deviations. The Supermap series started in 1988, featuring 1986 census data. Supermap2 followed with 1991 data, and Supermap 3 with 1996 census data. At this time Statistics New Zealand are unsure whether they will continue the provision of census data in Supermap format. Although it can be argued that Supermap is not a complete Geographic Information System, it does perform many of the functions, at a level that the beginner user can understand. A significant limitation with Supermap products is the inability to substantially change the data used for mapping. Because of this, it may be necessary to export the data to an Excel spreadsheet, modify it and then export it into a format where the formulae are removed and just the data remain. This can then be re-imported into Excel and then into Supermap (Wilson *et al.* 1996).

The move to small and powerful desktop computing systems in the last 10 years has fuelled the growth of desktop Geographic Information System. The two most popular desktop applications are MapInfo and ArcView – both are vector based and are based primarily on the Microsoft Windows platform. They both are able to undertake advanced spatial analysis and the production of high quality maps. They can accept and exchange data with other Geographic Information Systems, and have scripting language that enables the user to create there own modules. It is possible to link some of these geographic information systems to statistical programming environments to allow for more interactive spatial analysis. These programs include S-PLUS, LISP-STAT, REGARD, and SPLANCS, and extension to S-PLUS (Gatrell and Bailey 1996). This thesis uses MapInfo V4.0 for the Power Macintosh and V5.01 for Windows 95.

4.5.5 Mapping issues

Mapping is the most powerful method is displaying statistical geographical information (Tufte 1983). There have been a number of improvements in data presentation techniques in recent mortality atlases such as those for an Australian atlas, and guidelines for such atlases have been (Wilson *et al.* 1996). These guidelines

cover such issues as the appropriate use of plotting (symbols of density shading) and the use of colour scales. Exeter (1998) has centered on cartographic visualisation techniques in relation to a measles epidemic in Auckland. Recent work by Kirkpatrick (1997, 1999) in the development of the New Zealand Historical and Contemporary atlases has redefined how the presentation of statistical data can be illustrated.

Some of the problems of using maps for displaying information have been described, including areal bias where, with chloropleth methods (e.g. density shading), geographic regions with large areas are visually dominant (Walter 1993). Visual inspection of maps for 'clustering', as opposed to statistical measures of spatial autocorrelation, may also carry the risk of identifying 'false positive' clusters.

4.5.6 GIS data

In New Zealand, the potential geographical levels for use in spatial analysis include meshblocks, census area units (CAU's), wards, territorial local authorities, health districts, clusters of any of the former and regional health authority regions. The appropriate choice of geographical level depends on the need to have relatively stable disease or admission rates and to have areas that are relevant to the hazard of interest or health service delivery area (Wilson *et al.* 1996). Other data of interest to the spatial analyst is topographical data. Two government agencies are responsible for the provision of data – Statistics NZ for all statistically related data and Land Information New Zealand (LINZ) for topographically based data. One of the major challenges facing the utilisation of digital data in New Zealand is the high cost of obtaining it. Following a 'users pays' policy, government agencies have been charging astronomical fees, when compared to other OECD countries. In November of 1999, Land Information New Zealand is expected to reduce the cost of all LINZ held digital data, topographical maps and aerial photographs to reflect the cost of its dissemination.

4.5.7 Meshblocks

There are over 35 000 meshblocks associated with the 1996 Census data and they contain a median population of about 90 people. Christchurch is made up of 2760

meshblocks. As has been described there may be scope for combining meshblocks to create more homogeneous populations than can be done by using CAU's. Crampton *et al.* (1997a) used primary sampling units (PSU) which contains one or two or more geographically contiguous meshblocks for the development of the NZDep91 and NZDep96 indices.

4.5.8 Census area units

Census area units (CAU's) are made up of meshblocks. In the 1991 census there were 1716 CAU's and in 1996 there was 1873 CAU's. Approximately 97% of the CAU's contain at least one person. The maximum population of a CAU at this census was 8310 and the median was 3302 (Wilson *et al.* 1996). Christchurch contained 104 census area units within its city limits, but most studies involving CAU's in Christchurch use 112 – the difference being CAU boundaries in located around Lyttelton Harbour in Banks Peninsula District Council. As noted in section 4.2.1 there is a large difference between meshblock and census area unit populations. This can create problems when aggregating data and can provide a false picture.

4.5.9 Other statistical areas

There are other area boundaries available that are used in spatial analysis. Wards are based on electoral boundaries and do not overlap neatly with the CAU's. The population size of wards ranges from 348 to 50 574 people, with 7.0% having fewer then 1000 and 4.1% having more than 30 000 people. The medial population is 13 609. Wards are required to reflect communities of interest. (Wilson *et al.* 1996). Restructuring of local bodies under Amendment No. 3 Act 1988 saw a "wholesale amalgamation of territorial local authorities..." (Britton *et al.* 1993:215) with local councils being amalgamated into large city and district councils and hundreds of special purpose authorities being abolished in favour of regional councils. There are now 74 Territorial local authorities (TLA's) in New Zealand as defined under the Local Government Act 1974. Census area unit groupings can be combined into TLA's. Analysis at this level may be particularly appropriate for water supply quality and health issues (Wilson *et al.* 1996). There are 24 health districts in New Zealand. The population size of these varied greatly from several hundred thousand down to

only 20 000 (Ruapehu district). Not all of the health district borders match those of the former 14 area health boards. There are four Regional health authority (RHA's) regions. Although the Regional health authorities have been amalgamated into the Health Funding Authority, the boundaries are still used for comparison purposes. The populations of iwi and hapu trial districts may be of relevance to regional Maori provider organisations who may hold this information. Although there are digital boundaries available there is no linkage of this information with census information in such products as Supermap.

4.5.10 Topographical data

The 1:50,000 Digital Topographic Database contains data that can support a wide variety of specialised mapping applications. The 1:50,000 database is designed for localised work where completeness in respect to roads and hydro features is essential. The 1:50,000 database is extremely cost-effective when applied to specific projects. The data is fully structured. This preserves the fundamental spatial relationships among features that are normally recognised when visually examining a map. These spatial relationships include connectivity, adjacency and containment (LINZ 1999). The database is being continually updated as new information becomes available. Contours, spot-heights, road, rail and hydrographic are available for the entire country. The accuracy of the data is subject to the cartographic representation of the material on the Infomap 260 series. Ninety percent of well-defined features are within ±22 metres of their true position and within ±10 metres of their true height. This thesis use the topographic data only for background images in maps.

4.6 Summary

This chapter has highlighted the characteristics of the data and the methods used in this research. An understanding of the peculiarities of geocoding, admission data and census variables is of fundamental importance to the implications of the results. The methods employed in analysis in any research are similarly critical to the results obtained. The first section in this chapter has concentrated on geocoding of the admissions dataset. Limitations in the methodology exist in; structural problems with

hospital admission data (i.e. input error, mis-coding, multiple re-admissions etc) and geocoding errors. The second section discussed various deprivation indices in use in New Zealand. The NZDep91 and NZDep96 indices were used, with the proviso that the deciles scores were (i) relative to New Zealand as opposed to just Christchurch and (ii), caution was used when using for a temporal study. Section three explored the statistical analysis and section four geographic analysis. In particular the issue of the ecological fallacy, place of resident misclassification and multi-level modeling were discussed. The chapters that follow focus on the results found in this study and can be considered in the light of the methods adopted for this research.

CHAPTER FIVE

CHRISTCHURCH CASE STUDY – BROAD TRENDS

5 Introduction

The objective of Chapter Five is to examine and analyse admissions to Christchurch hospital over the period 1988 to 1998. In particular the discussion is centered on how the composition of admissions to Christchurch Hospital has changed over the last 10 years. It is intended to (i) describe the broad changes in admissions and (ii) compare these changes in admissions to deprivation indices. This is in line with the second objective of this thesis - to determine the extent to which neighborhood socio-economic status (i.e. deprivation indices) can predict variations in hospital admissions. The data is 'raw' (i.e. not age or gender standardised) and is meant only to outline trends. Previous studies (e.g. Jackson 1999) have noted that age and gender standardisation at this level do not in fact make much difference to overall rates.

5.1.1 Hospital versus population based data

This thesis uses the MDS dataset supplied from the New Zealand Health Information Service. It contains all discharges from Christchurch Hospital over a 11 year period. Previous studies of this nature (see Jackson *et al.* 1997 and Jackson 1999 for example) have used hospital discharges based on a set population catchment area. As described in Chapter 4, the principle dataset being used is *total admissions* to Christchurch Hospital as opposed to *admissions by Christchurch residents* into a public hospital. By examining the variations in admissions to Christchurch Hospital, we can relate them to the broader trends of health restructuring that have occurred over the last decade. As most people are admitted to the nearest hospital in their locality we can still examine the population characteristics of a certain area. More important is that Christchurch Hospital is the only major accident and emergency hospital in Christchurch, and takes the vast majority of acute admissions.

As is illustrated in table 5.1 below 96.2% of Christchurch City residents admitted to hospital were admitted to the either Christchurch, Christchurch Women's, Burwood or Princess Margaret hospitals. Christchurch Women's Hospital specialises in maternity and women's health, Burwood in spinal and burn injuries and Princess Margaret in the care of the elderly.

Table 5.1: Percentage of residents in each locality of Canterbury going to each hospital, total admissions, 1996 (percentages under 4% have been omitted).

Locality of residents	Hospitals			
	Timaru	Ashburton	Christchurch hospitals	Other hospitals
North Canterbury			70.7	28.2
Canterbury			82.5	15.8
Christchurch			96.2	
Mid Canterbury		73.7	20.2	
South Canterbury	90.9		5.9	

Source: Health Funding Authority 1998

As the primary tertiary hospital in Canterbury, Christchurch Hospital also services the rural areas of mid and north Canterbury. Apart from the higher rate of death and injury due to motor vehicle accidents in rural areas, there appear to be few significant differences in the health of rural and urban residents independent of socio-economic differences. There also tends to be fewer social and economic differences within rural localities than within urban localities, with fewer extremes of affluence and poverty and less disparity in health status (Health Funding Authority 1998).

Thus, this thesis will be confining itself to the examination of Christchurch Hospital discharge data, using residents within the Christchurch City Boundary as its statistical population.

5.1.2 Background

The Christchurch region has four main public hospitals split between the two Hospital and Health Service enterprises[1] - Canterbury Health and Healthlink South. Canterbury Health Limited provides health and disability services, principally in the Canterbury region, but also beyond for certain specialist tertiary services. Healthlink South provides key health services for those suffering from mental illness, intellectual

[1] Formally known as Crown Health Enterprises or CHE's

disabilities and illnesses relating to age. Christchurch Hospital, Burwood and more recently Christchurch Women's Hospital are part of Canterbury Health. Healthlink South includes Princess Margaret Hospital in Christchurch, and several smaller rural hospitals including Rangiora, Oxford and Kaikoura. Christchurch Hospital is also a teaching hospital affiliated with the University of Otago School of Medicine. In December of 1997 Christchurch Hospital established cardiothoracic services, in a joint venture with Healthcare Otago. By 30th June 1998 over 49 heart operations had been performed and elective angioplasty had commenced (Canterbury Health 1998). Figure 5.1 maps Christchurch's Public Hospitals.

The population of Christchurch has ranged from about 285,000 in 1988 to just over 320,000 in 1997. Total admissions into Christchurch Hospital over the same period ranged from 18,646 to 46,757 respectively. Bed numbers increased from 514 in 1998 to 617 in 1998.

5.2 Nature of admissions into Christchurch Hospital

Section 5.2 outlines admissions into Christchurch hospitals by Christchurch residents in the context of how total admissions can be split up into different categories. These categories include total admissions, in-patient and day-patient admissions, acute and elective admissions, avoidable and ambulatory sensitive admissions and length of stay. Of particular interest is how these specific categories, as a percentage of total admissions, have changed over the period 1988 – 1998.

5.2.1 Types of admissions

Before examining trends, it is important to define the different categories in the context of admission data. Admissions into Christchurch Hospital by Christchurch residents is defined as admissions by 'usually resident' individuals, domiciled in the Christchurch City Council area. The data is based on the address in the NZHIS MDS. This Christchurch City Council region is displayed as the grey area on Figure 5.1. *Out-patients* are defined as individuals who are admitted to hospital for more three hours but do not stay overnight. *In-patients* are defined as individuals who are

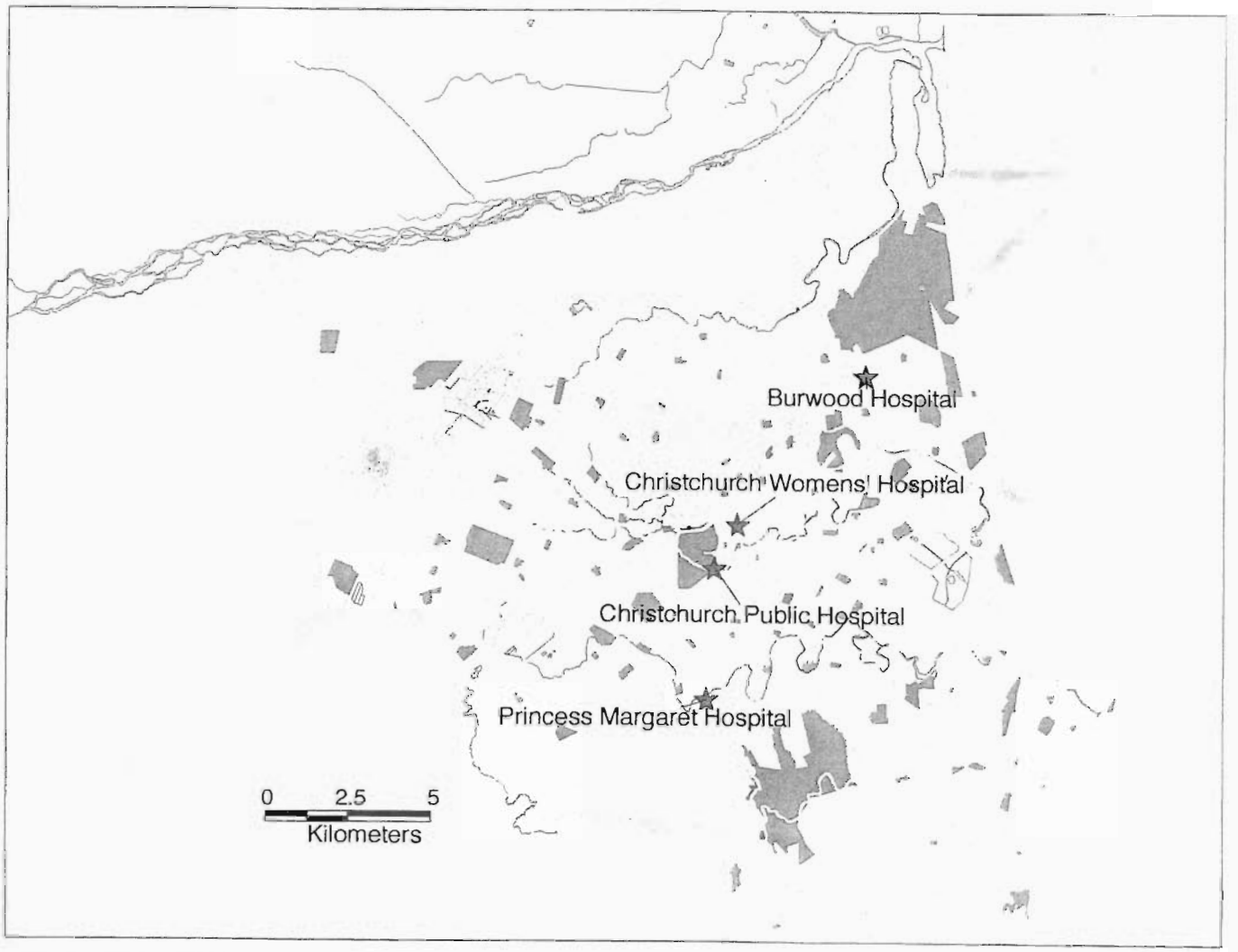
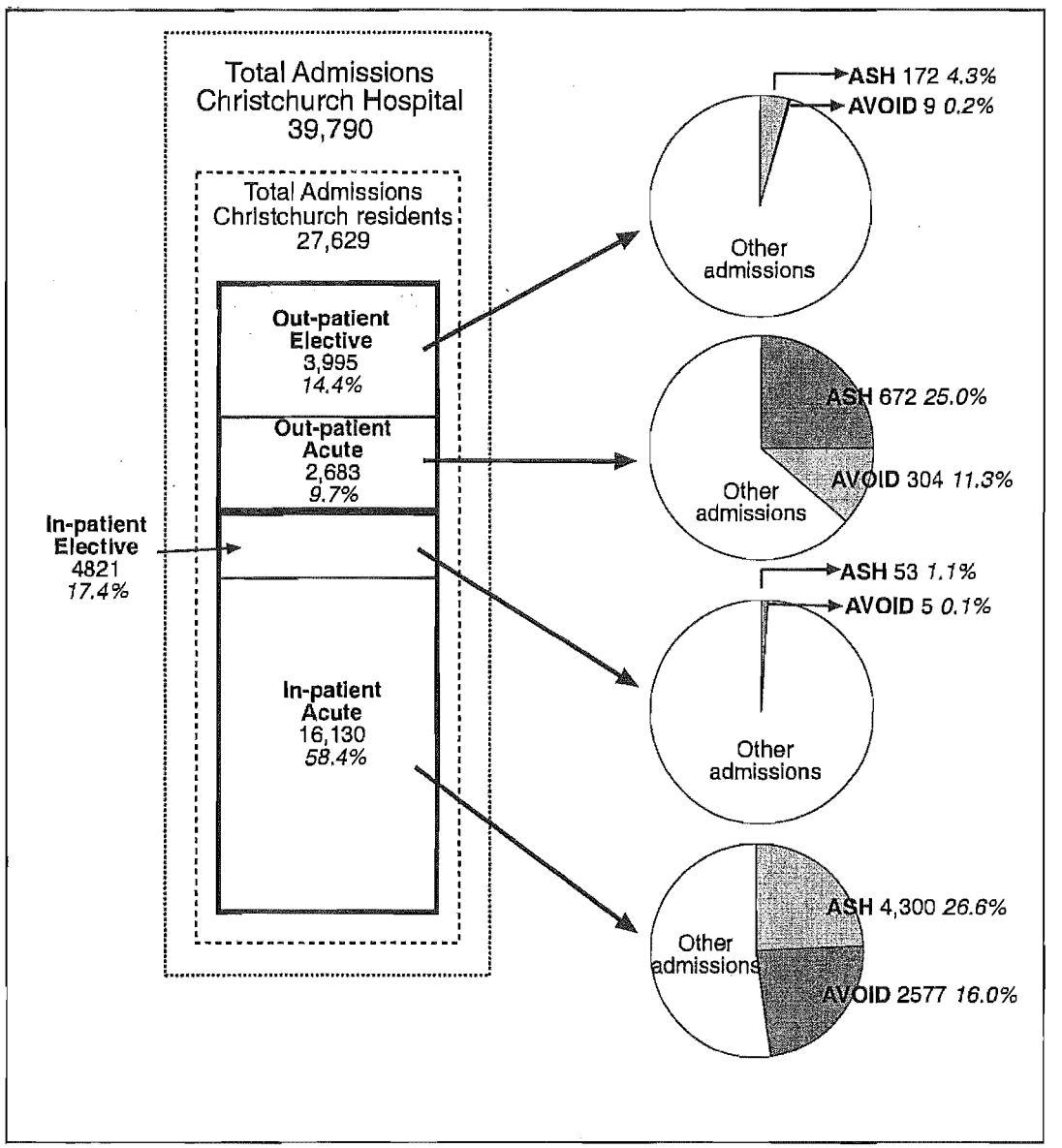


Figure 5.1: Map of Christchurch City, location of public hospitals, 1999

admitted to hospital for an overnight stay. An *elective* or waiting list admission is one where the admission date is seven days or more after the date the decisions was made by the specialist that this admission was necessary. An *acute* admission is defined as an unplanned admission on the day of the individual presenting themselves to the health care facility. A third admission category, *arranged admissions* is used when

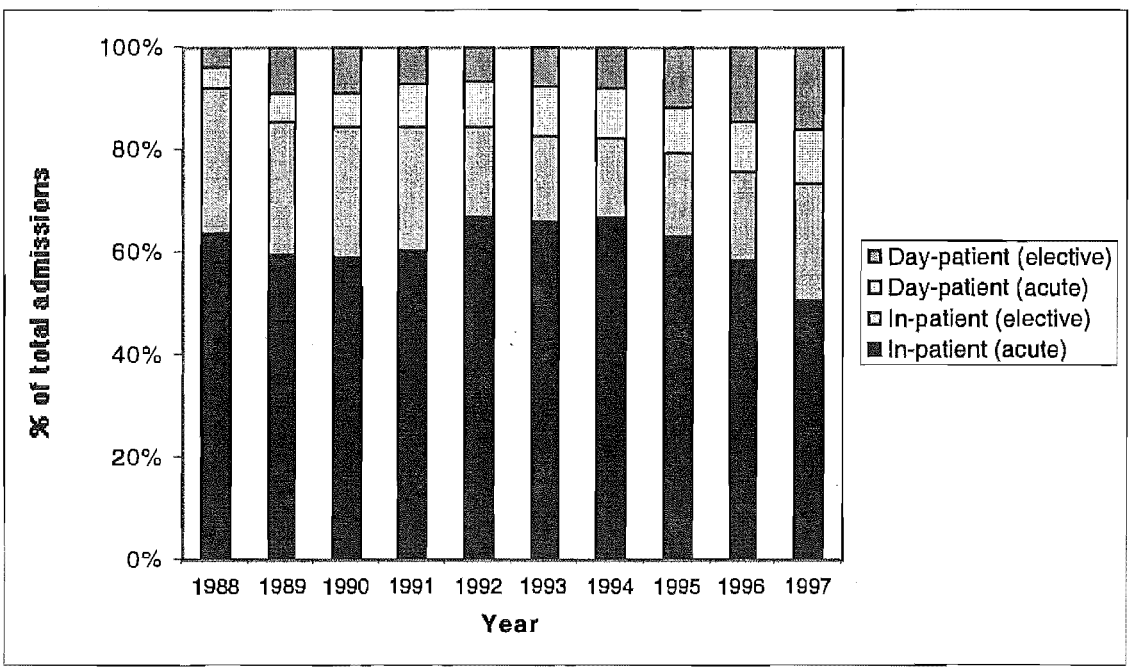
the planned admission date is less than seven days. This is used in less than 1% of all admissions. *Avoidable hospitalisations* (AVOID) are admissions that can be largely avoidable given appropriate medical intervention while *ambulatory sensitive hospitalisations* (ASH) are admissions for disease that generally may be controlled in the primary health sector. Both the avoidable and ambulatory sensitive admission have overlapping disease categories – this is discussed further in section 5.2.5, and the full listing of diseases in Appendix Five and Six. The composition of admissions is illustrated, as a snapshot of total 1996 admissions, in Figure 5.2.



Source:NZHIS MDS

Figure 5.2: Composition of admissions to Christchurch Hospital, 1996

This will give the reader an understanding of how the admissions are broken down. Of particular note is how the majority of both avoidable and ambulatory sensitive admissions are mainly acute admissions. Figure 5.3 illustrates the change in pattern of admissions for the period 1988 – 1997. As can be seen acute in-patient admissions have dropped as percentage of totals admissions, while elective admissions have risen. This trend is especially noticeable after 1993, when the latest round of health reforms were enacted.

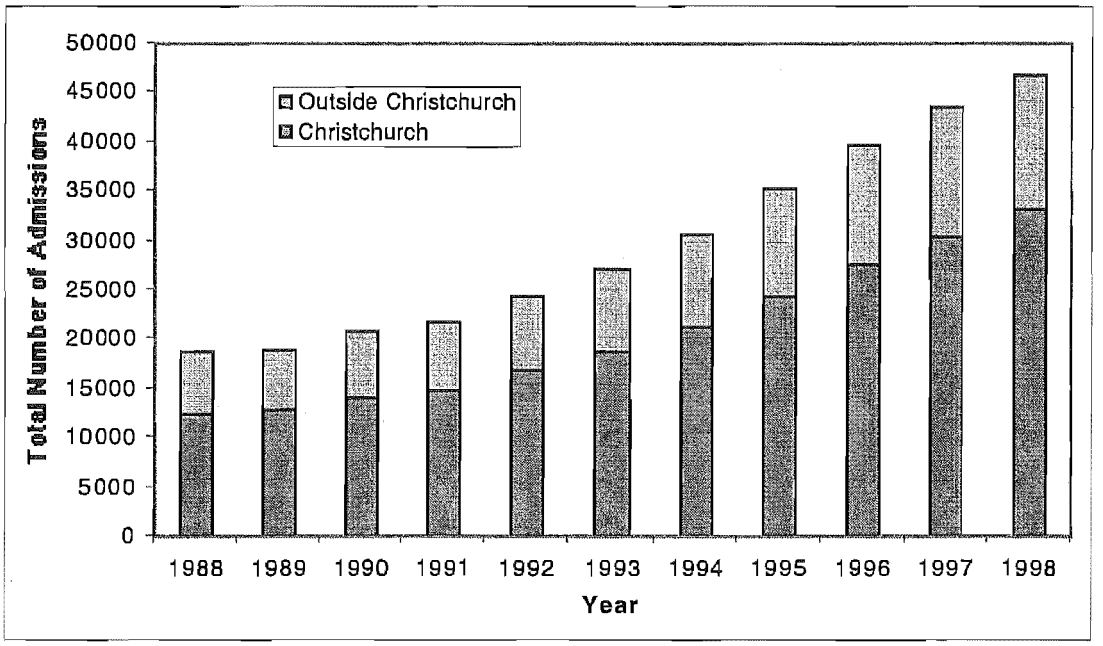


Source: NZHIS MDS

Figure 5.3: Composition of total admissions, day-patient vs. in-patient, elective vs. acute, Christchurch residents, Christchurch Hospital, 1988 - 1997

5.2.2 Total admissions

Total admissions into Christchurch Hospital were calculated over the period 1988 to 1998. This was then broken down into total admissions by Christchurch residents. In 1998 Canterbury Health encountered a 10% increase in the number the total number of patients treated, and an 8% reduction in the average length of stay for those patients. As is indicated in Figure 5.4 Christchurch Hospital has had a steady increase in the number of admissions, mirroring the increase seen in New Zealand as a whole.



Source: NZHIS MDS

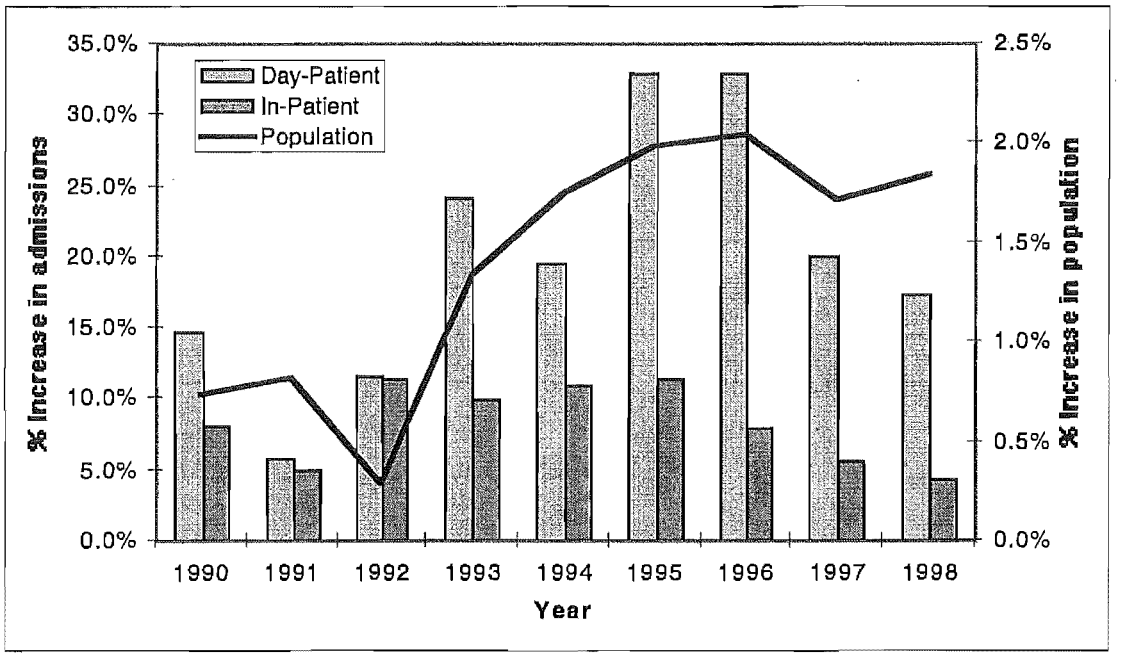
Figure 5.4: Admissions into Christchurch Hospital, total and Christchurch residents, 1988-98.

Over the period 1988 – 1998 admissions into Christchurch hospital by Christchurch residents rose slightly from 69% to 71% of total admissions. The rate of admission per 1000 residents has jumped over 100% - from 44 to 102 per 1000 residents.

Figure 5.5 compares the increase in admissions into Christchurch Hospital by residents of Christchurch (day-patients and in-patients) with the increase in the population of Christchurch. The increase in total admissions can partly attributed to the increase in day-patients.

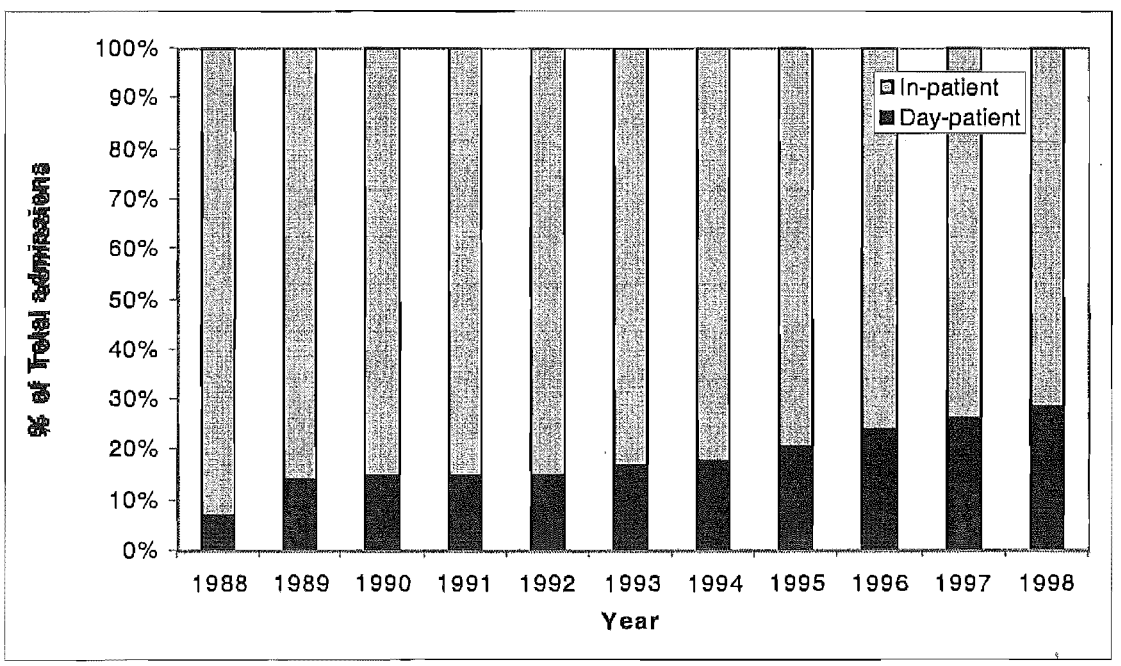
5.2.3 Day-patient versus in–patient admissions

Between the period 1988 – 1998 there was a fourfold increase in day-patient admissions, increasing from 8% of all admissions to 30% of all admissions. The rise in day-admissions can be seen to be following the international trend of using less invasive, hi-tech techniques involving less trauma for the patient and quicker recovery (CCMAU 1996). This is seen in Figures 5.5 and 5.6.



Source: NZHIS MDS and Supermap 3

Figure 5.5: Comparison of; total Christchurch Hospital admissions, Christchurch residents; and growth of population of Christchurch, 1990/98

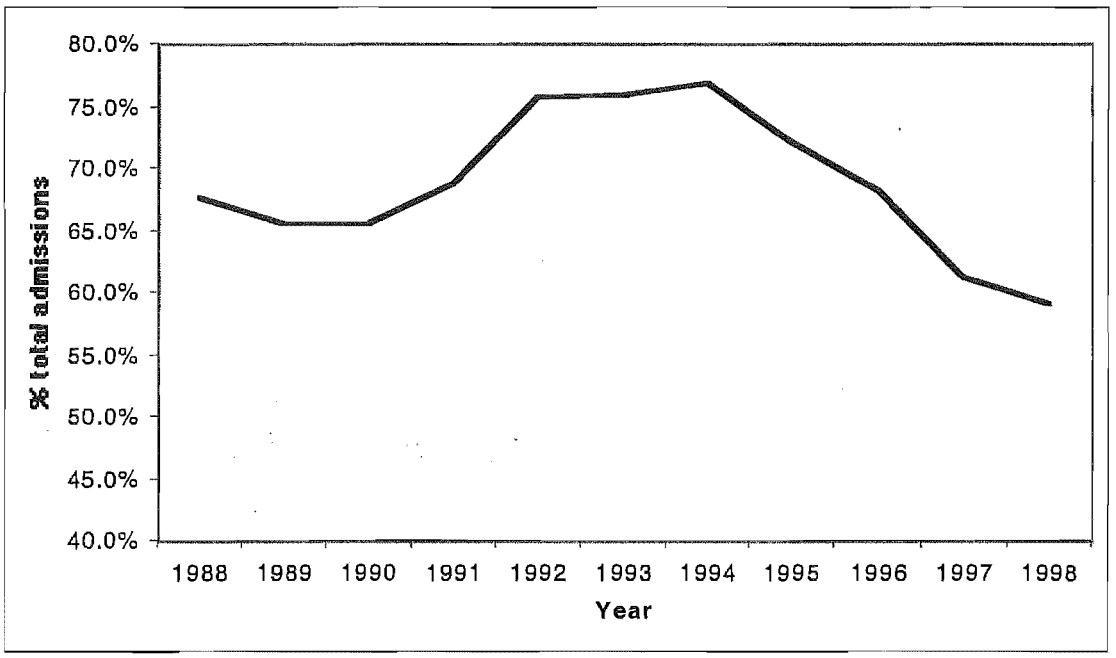


Source: NZHIS MDS

Figure 5.6: Total admissions, in-patient vs day-patient, Christchurch residents, Christchurch Hospital, 1988 – 1998.

5.2.4 Acute admissions

One way of measuring the health status of a population is the measure of acute admissions. Acute admissions as percentage of total admissions at Christchurch Hospital show an overall decline. As seen in Figure 5.7 below acute admissions in 1998 made up about 60% of all admissions.



Source: NZHIS MDS

Figure 5.7; Acute admissions as percentage of total in-patient admissions, residents of Christchurch, Christchurch Hospital, 1988 – 1998.

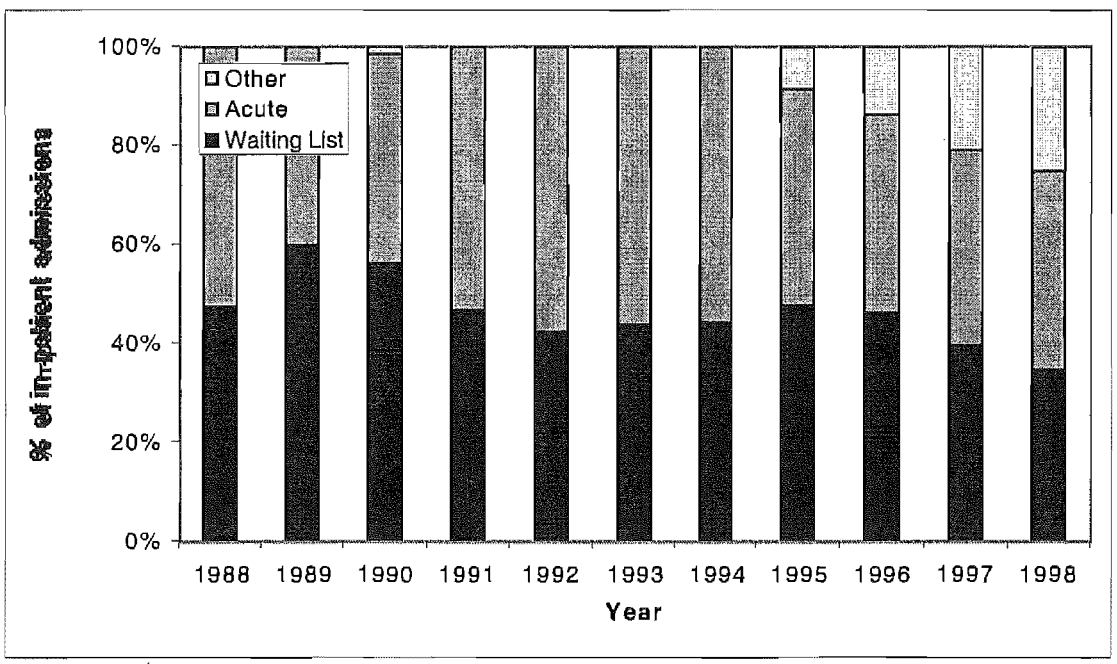
When the acute admissions as a percentage of total admissions is broken up into day-patient and in-patient categories, a clearer trend emerges. Table 5.2 below clearly shows day-patient acute admissions rising, while in-patient acute admissions dropping nearly 25% from the 1994 high of 66.9% to 50.6% of total admissions.

Table 5.2: Acute day-patient and in-patient admissions, percentage of total admissions, Christchurch residents, Christchurch Hospital, 1989 – 1987.

Acute	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Day-pat. %	4.0	5.7	6.5	8.2	8.8	9.6	9.9	8.9	9.7	10.4
In-pat. %	63.5	59.8	59.0	60.5	66.9	66.2	66.9	63.1	58.4	50.6

Source: NZHIS MDS

As shown in Figure 5.8 both acute and elective admissions have dropped as a percentage of total day-patient admissions. This is partly due to coding changes, which have seen new admission types added. This coding change in 1995 was in response to the Accident Rehabilitation and Compensation Insurance Corporation (ACC) becoming responsible for purchasing acute and elective surgery for its clients. Before 1995 these were included under there respective categories (See Appendix Four for breakdown of Admission codes).



Source: NZHIS MDS

Figure 5.8: Day-patient admissions, acute vs waiting list, Christchurch residents, Christchurch Hospital, 1988 – 1998.

5.2.5 Elective admissions

An *elective* or waiting list admission is one where the admission is planned at least a week in advance. For hospital services, elective surgery is one of the main indicators of access. The waiting list increased steadily in the three years after 1993, until by 1996 there were almost 100,000 New Zealanders waiting for surgery. Table 5.3 shows all elective admissions, and there percentage as a total of all admissions into Christchurch Hospital by Christchurch residents.

Table 5.3: Elective admissions, Christchurch Hospital, Christchurch residents, 1988 - 1997

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Admissions	4029	4440	4822	4587	4093	4531	4928	6837	8816	11792
% of total	32%	35%	35%	31%	24%	24%	23%	28%	32%	39%

Source: NZHIS MDS

Figure 5.9 graphically illustrates the change in elective admission patterns in day-patient and in-patient admissions. Notable is the increase in both day and in-patient elective admissions which may signal the extra $235 million spent as part of government policy to reduce waiting lists (Ashton 1999).

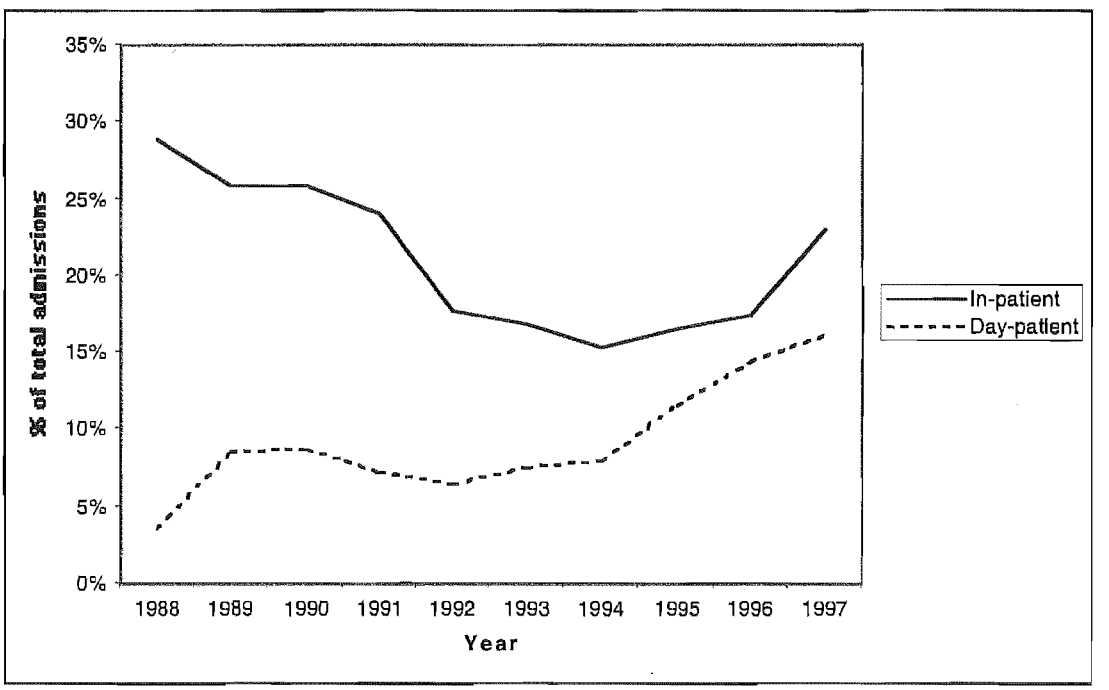
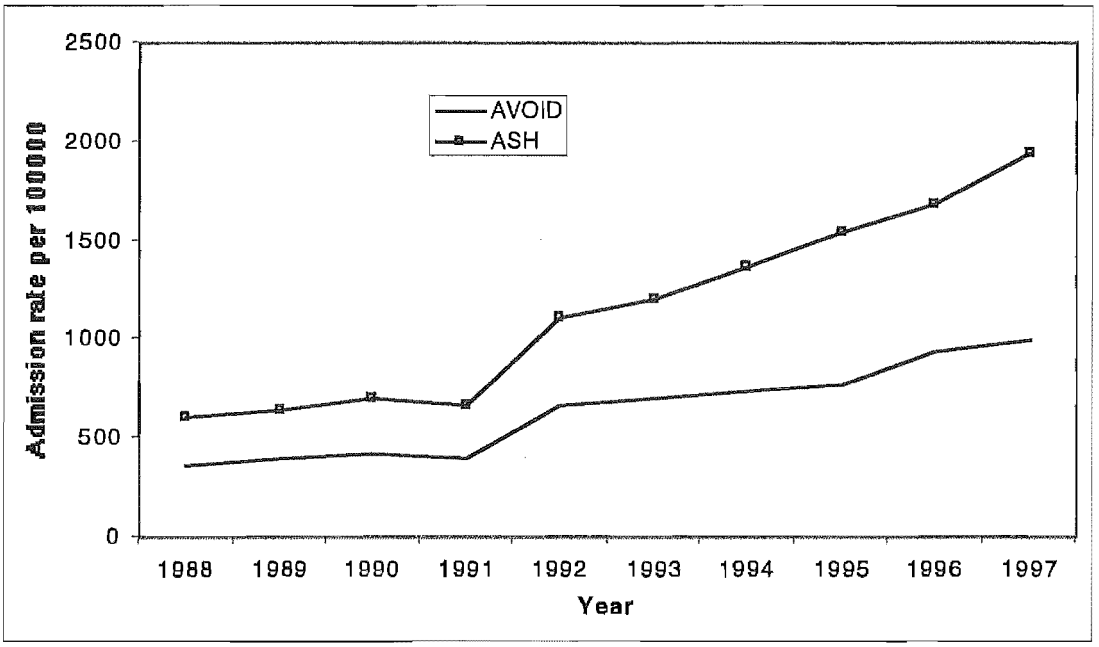


Figure 5.9: Total admissions, in-patient vs. day-patient, Christchurch residents, Christchurch Hospital, 1998 – 1997

5.2.6 Avoidable and ambulatory sensitive admissions

Studies have identified links between varying levels of *avoidable hospitalisation* and inequalities in health care delivery. Avoidable hospitalisation (AVOID) has become widely accepted as a population health status measure. The concept of 'avoidable' mortality originated from Rutstein *et al.* (1983) who proposed a list of 'sentinel health events'. The list was based on diseases that were largely avoidable given appropriate medical intervention. Several authors have further developed a list of conditions that can be considered avoidable, including Charlton *et al.* (1983), Westerling (1992) and Poikolainen *et al.* (1986). A full listing of diseases included as 'avoidable' is listed in Appendix Five, as based on North Health's report on avoidable hospitalisations (Jackson *et al.* 1998). *Ambulatory sensitive hospitalisations* (ASH) comprises of those conditions which can lead to hospitalisation and death, but may generally be effectively controlled at a primary care level (Manitoba Department of Health 1992). This measure can be used to monitor the effectiveness of primary care by looking at secondary care utilisation. It must be noted that there is some overlap with the group of avoidable hospitalisations, but generally a wider group of conditions is described (Jackson *et al.* 1998). A full listing of diseases in the Ambulatory sensitive category is listed in Appendix Six. As is seen in Figure 5.2, both these admission categories are mainly elective admissions, as opposed to acute admissions.

As is illustrated in Figure 5.10, during the period 1988-1998, avoidable hospitalisations made up about 10% of all hospital admissions at Christchurch Hospital, while ambulatory sensitive hospitalisations increased from 14% to 18.5% of all hospital admissions. This mirrored changes in other parts of New Zealand including the North Health region (Jackson *et al.* 1998). Over the 1989 – 1997 period ambulatory sensitive hospitalisations increased three fold per 100000 population. Jackson *et al.* (1998:17) contend that 'Changes of this rapidity are unlikely to be due to changes in disease patterns...' but more likely to reflect changes in general practice and hospital organisations at that time. This can include such factors as increased business orientation of general practitioners, independent practitioner organisations (IPA's) and accident and medical centres, and casemix funding for Crown Health Enterprises.



Source: NZHIS MDS

Figure 5.10: Avoidable and ambulatory sensitive admissions, Christchurch residents, Christchurch Hospital, 1989 – 1997

5.2.7 Gender and age

Admissions to hospital can differ based on age and gender. Admissions into Christchurch Hospital by Christchurch residents didn't change by gender over the period 1988 - 1998. Females accounted for 48% of admissions and males 52 %. Admissions over the same period for New Zealand as whole showed a different story. As table 5.4 shows, females in New Zealand, as a whole make up between 40 and 43% of all admissions into public hospital.

Table 5.4: Percentage of Female and Male admissions, Christchurch and New Zealand, 1988 – 1998.

		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Chch	F	48	48	48	48	47	47	47	48	48	48	48
	M	52	52	52	52	53	53	53	52	52	52	52
NZ	F	40	40	40	41	42	43	43	43	43	43	43
	M	60	60	60	59	58	57	57	57	57	57	57

Source: NZHIS MDS

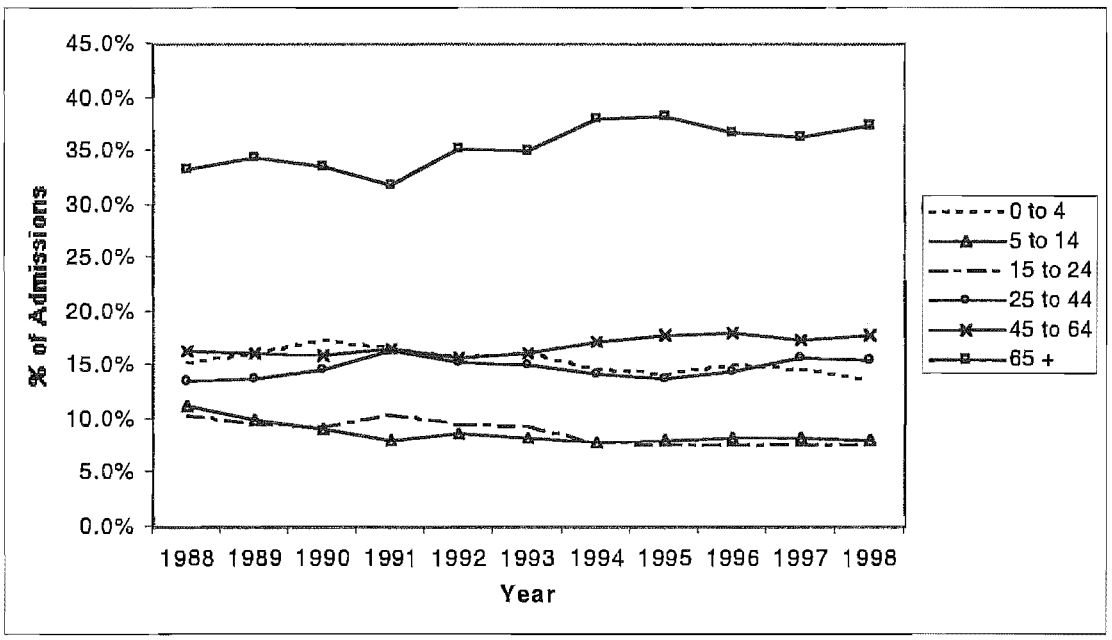
As the gender structure of Christchurch's population is similar to that of New Zealand as a whole (as seen in Table 5.5) the difference can not be accounted for by regional variations.

Table 5.5: Percentage of Female and Male populations, Christchurch and New Zealand, 1996.

	Christchurch	New Zealand
Female	51.6	50.2
Male	48.4	49.1

Source: SuperMap 3

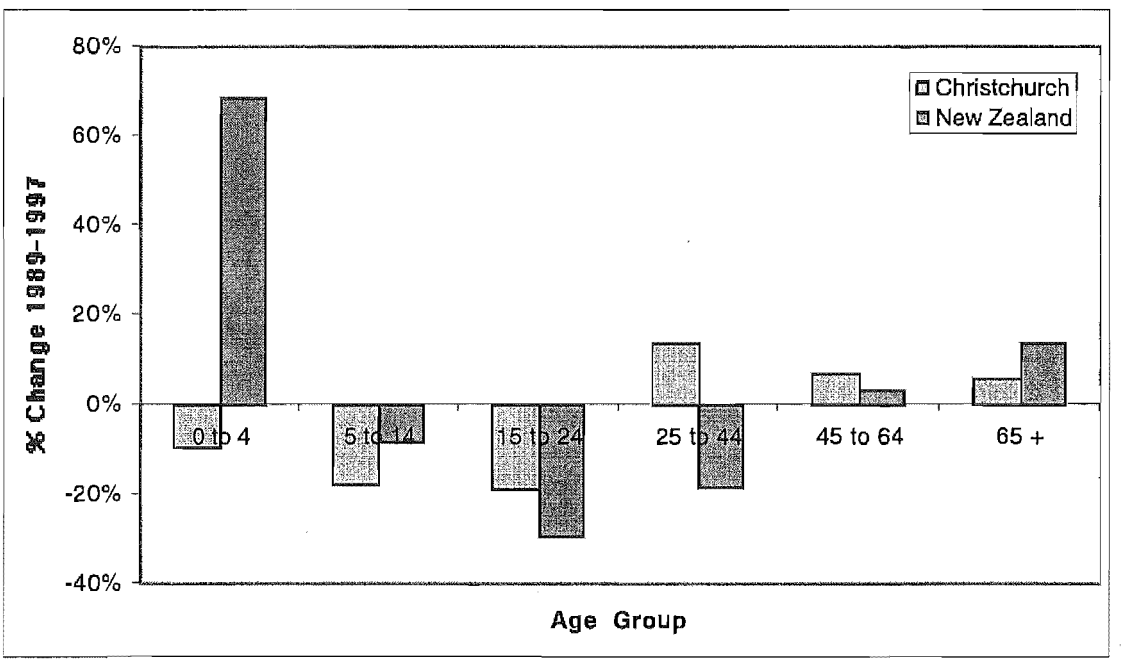
One reason for the difference between Christchurch and New Zealand could be the different age structures. Admission by age, as shown in Figure 5.11 showed some very different trends.



Source: NZHIS MDS

Figure 5.11: Admissions by age group by percentage of total admissions, residents of Christchurch, Christchurch Hospital, 1988 – 1998.

The lower age groups all experienced declines in admissions as a percentage of total admissions. The upper age groups increased admissions as a percentage of total admissions. Of particular interest is the 5 to 14 and 15 to 24 age groups which showed a 25% decrease in admissions over the 10 year period. Figure 5.12 shows the change in admission rates between age groups in both Christchurch and New Zealand. Of particular note is the dramatic increase in the 0 to 4 age group for New Zealand, while Christchurch has an actual decrease. This change in part reflects the opening of the Starship Children's Hospital in Auckland, and the use of Christchurch Women's Hospital for birth-related complications. The drop in the 15 to 24 age group can be partly attributed to the drop in motor vehicle accidents. Also notable is the difference in the 25 to 44 age bracket. As Christchurch Hospital is served by a public geriatric hospital (Princess Margaret), and several private geriatric hospitals, elderly related admissions in the 65 plus age bracket could have taken place at the respective hospitals rather than Christchurch Hospital.



Source: NZHIS MDS

Figure 5.12: Percentage change in admission, residents of Christchurch, Christchurch Hospital, 1988 – 1998.

5.2.8 Length of stay

The number of nights that a patient spends in hospital is commonly referred to as length of stay in hospital. If a patient is discharged and admitted on the same day then length of stay is zero and he or she is classified as a day-patient. If a patient spends at least one night in hospital then he or she is classified as an inpatient. The Ministry of Health includes day-patients in its calculations of average length of stay. This is because "...appropriate treatment as a day-patient is to be encouraged and a CHE[2] that is doing a high proportion of their cases on a day case basis will be 'rewarded' by having a shorter average length of stay" (Ministry of Health 1998:288). The average length of stay is used as one of the benchmarks in monitoring the efficiency of hospitals by the Ministry of Health.

The average length of stay in the 1996/97 period in New Zealand was 3.9 days (Ministry of Health 1998). This compares with the Southern Health Funding Authority region as a whole of 3.5 days. As depicted in Table 5.6 females have a longer average length of stay than males.

Table 5.6 : Average length of stay in days, males and females, 1992 –96 Southern HFA region

	1992	1993	1994	1995	1996
Female	4.9	4.5	4.2	3.9	3.5
Male	4.1	4.2	4.0	3.7	3.5

Source: Health Funding Authority 1998

Canterbury Health has measured it's average length of stay using inpatient data only. As up to a third of admissions are for day patients this can raise the average length of stay. Thus compared to the regional and national rates the figures for Canterbury Health given in Table 5.7 are artificially high.

[2] Crown Health enterprise – now known as Health and Hospital Services

Table 5.7 : Average Length of Stay in Canterbury Health Hospitals, 1995 – 1998 financial years

	1995	1996	1997
Canterbury Health (Inpatient only)	6.4	6.8	6.3
Christchurch Hospital (Inpatient only)	6.1	5.8	5.4
Christchurch Hospital (All admissions)	4.5	5.0	3.7

Source: NZHIS MDS and Canterbury Health Limited 1998

The average length of stay at Christchurch hospital has remained slightly over the national average. As Canterbury Health includes Burwood Hospital, there are many long-term patients in the burn and spinal injury units. The presence of a small number of records with an exceedingly long length of stay creates a problem for the calculation of average length of stay. These records have an influence on the average length of stay that is disproportionate to their number. Because they are rare and hence prone to fluctuate widely from period to period, their effect on the average length of stay may not reflect the hospitals standard practices. If a hospital deals with a disproportionately high number of cases with a high likelihood of staying a long period in hospital, then it is likely that the average length of stay for that hospital will, with all other things being equal, be longer than another hospital with a smaller proportion of such cases.

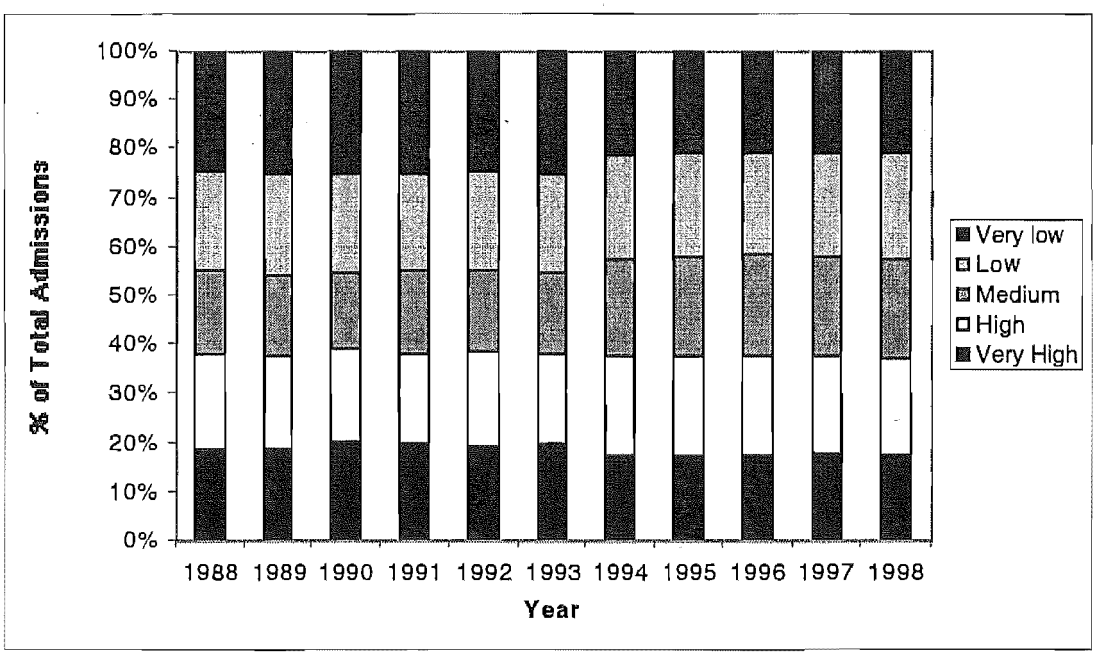
5.3 Trends in admissions by socio-economic status and ethnicity

This section discusses admissions into Christchurch Hospital by socio-economic status and ethnicity. Of importance is the change in admissions over time between different socio-economic groups.

5.3.1 Admissions by socio-economic status

With such a large increase in the rate of admissions, and based on the evidence presented in the previous chapter of increasing deprivation in Christchurch, one would expect that the residents in the lower socio-economic areas would have make up a greater part of the admissions. As depicted in Figure 5.13 this does not seem to

be that case. In fact, residents who reside in the very high and very low socio-economic areas have experienced a relative decrease as a percentage of total admissions. The very low socio-economic group made up 25% of all admissions in 1988, while in 1998 they made up 21% - a drop of over 16%. The very highest socio-economic grouped dropped from 19% of total admissions to 17%. The most dramatic change is those in the 'Medium' category – a 25% increase in admissions, while the 'Low' and 'High' showed smaller increases in admissions. This broad change in suggests several premises. Firstly, residents in the higher socio-economic groups are using the public hospital system less, which probably could be contributed to better utilisation of primary health care facilities and a trend towards increased use of private medical facilities.



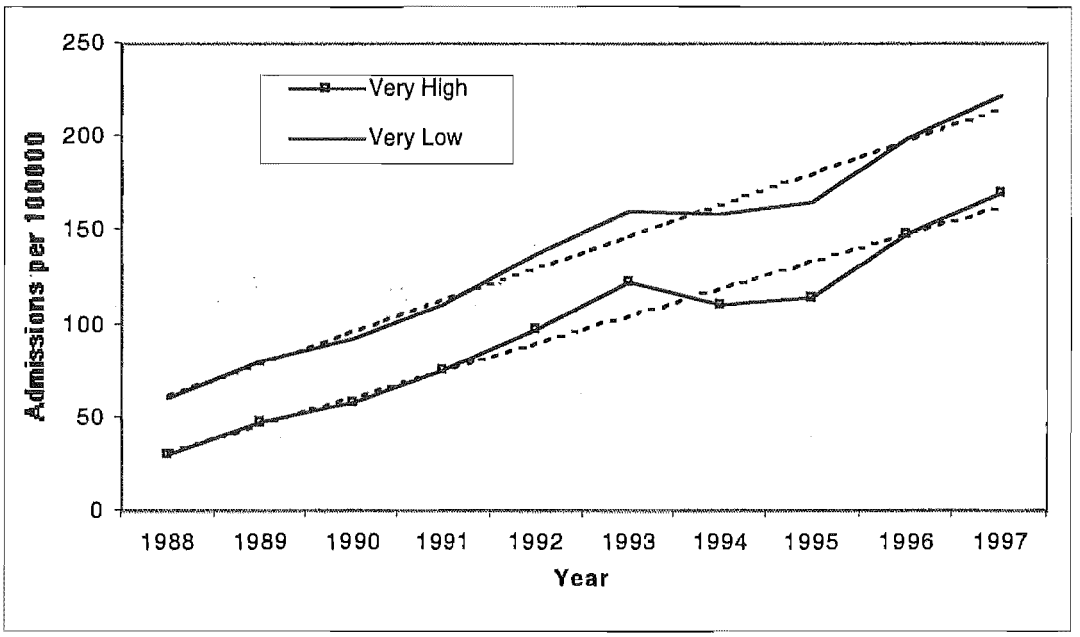
Source: NZHIS NMD

Figure 5.13: Socio-economic makeup as percentage of total admissions, Residents of Christchurch, Christchurch Hospital, 1988 – 1998.

The relative decrease in the share admissions from the lower socio-economic classes is more difficult to explain.

As discussed in Chapter Three acute admissions are sensitive to socio-economic status. Figure 5.14 depicts all acute day-patient admissions into Christchurch Hospital

from Christchurch residents. These admissions are usually visits to the Accident and Emergency department, without a resulting overnight stay. Over the period 1988 – 1998 residents in the high socio-economic areas experienced a seven fold increase in the rate of admissions. In the same period residents from the lower socio-economic areas were nearly 4 times more likely to visit the emergency room at Christchurch Hospital. More importantly was that the lower socio-economic groups were 30% more likely to visit the Accident and Emergency department than higher socio-economic groups.



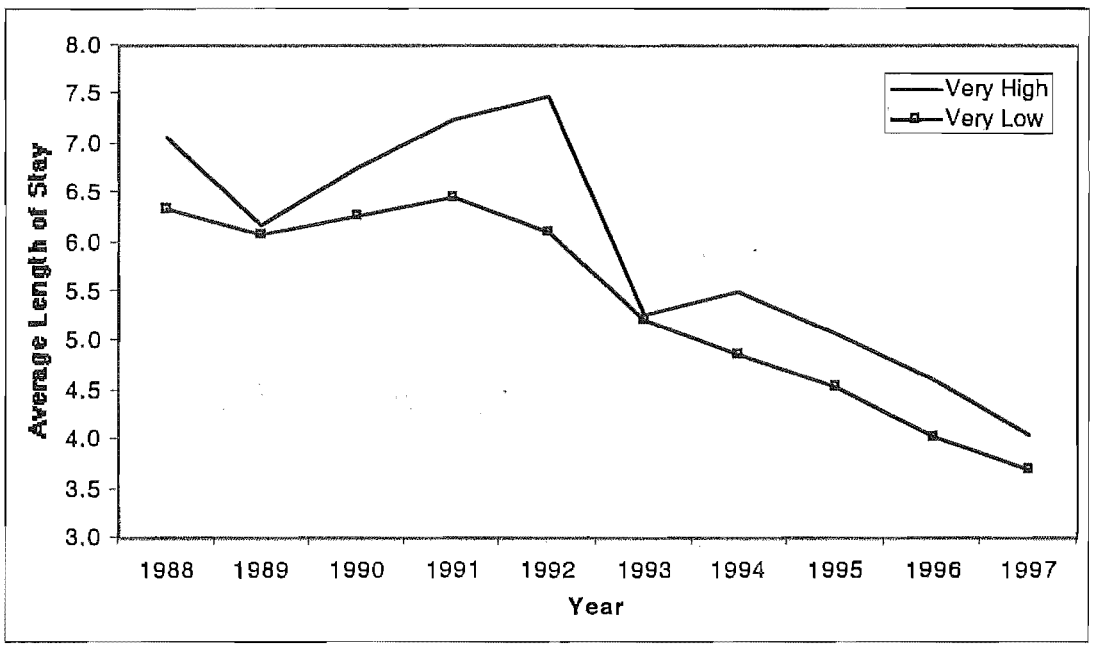
Source: NZHIS MDS

Figure 5.14: Acute admissions, day patients, residents of Christchurch, Christchurch Hospital, 1988 – 1998.

Such was the increase in Accident and Emergency room visits in the 1996/97 period that Christchurch Hospital ran an advertising campaign encouraging the public to see their nearest doctor early rather than waiting until it becomes an emergency. This large increase is one indicator that the primary health care system is failing in its basic premise of preventing disease and illness.

What is more interesting from the Christchurch Hospital admission statistics is the disparity between the lower and higher socio-economic groups in average length of

stay. Patients resident in the higher socio-economic areas of Christchurch stay an average of at least 10% longer than patients from less well off areas. Figure 5.15 illustrates the difference between the lowest and highest socio-economic groups, and more importantly the gradual shortening of hospital stays, which is consistent with national figures. Over the last 10 years the average length of stay at Christchurch Hospital by Christchurch residents has dropped by at over a third.



Source: NZHIS MDS

Figure 5.15: All admissions, Average Length of Stay, Christchurch Residents, 1988-97, Christchurch Hospital by socio-economic status

Of special interest is the large drop (over 2 days) in the 1992-1993 period, in average length of stay from patients in the highest socio-economic group. At this time part-user charges were implemented, and thus, it can be hypothesised that the introduction of financial charges resulted in shorter hospital stays, especially for those individuals in the higher socio-economic groups. The canceling of the part-user charges in 1994 saw a resultant increase in the average length of stay for the highest socio-economic group.

Researchers have long noted that the quality of medical care received by persons of low socioeconomic groups is poor relative to that received by higher socio-economic groups. As Scott *et al.* has noted, "in terms of access and utilisation, health services may be equitable at the first point of contact but not thereafter" (1996: 45). For example, it has been shown that low socio-economic patients tend to have shorter consultations and receive less information on their condition, than their higher socioeconomic status counterparts. (Scott *et al.* 1996). Socio-economic differentials have been noted in measures of doctor-patient 'rapport'. Williams (1990:86) contends, this may be due to the middle class origin of medical services, such that "there is little discrepancy between the culture and organisation of health service delivery and that of middle class clients. In contrast, members of the lower socio-economic groups find that interaction with the medical system is a dehumanising experience".

The literature has also shown that doctors decision-making processes are independently associated with the socioeconomic status of patients. Specifically, researchers have found the likelihood of the request or performance of diagnostic tests, follow-up (Scott *et al.* 1996) and referrals to specialists (Blaxter 1990), to vary inversely with patient socioeconomic status. Davis *et al.* (1996) conclude that observations such as these demonstrate clearly the operation of the 'inverse care law'. The inverse care law proposes that those individuals most in need of adequate medical care are also least likely to receive it. In other words, it calls attention to the lesser quantity and quality of medical care received by members of the lower socioeconomic strata, in the face of their generally poorer health status (Macintyre 1986).

It may also be argued that because of the structural implications of being from the lowest socio-economic group, (i.e. being a solo parent, less income, less flexible employment conditions etc.) individuals have more pressure to be discharged sooner.

5.3.2 Admissions by Ethnicity

Ethnicity is another major factor in determining both socio-economic status and health status. Studies have shown, both in New Zealand and overseas, that minority

groups are over-represented at the lower end of the socio-economic scale. In 1996 nearly seven percent of Christchurch residents identified as Maori, and two percent as Pacific Islanders. As can be seen in Table 5.8, Maori and Pacific Island representation in Christchurch is predominantly grouped in the low and very low socio-economic areas.

Table 5.8: Percentage distribution by ethnicity, NZDep96, Residents of Christchurch, 1996.

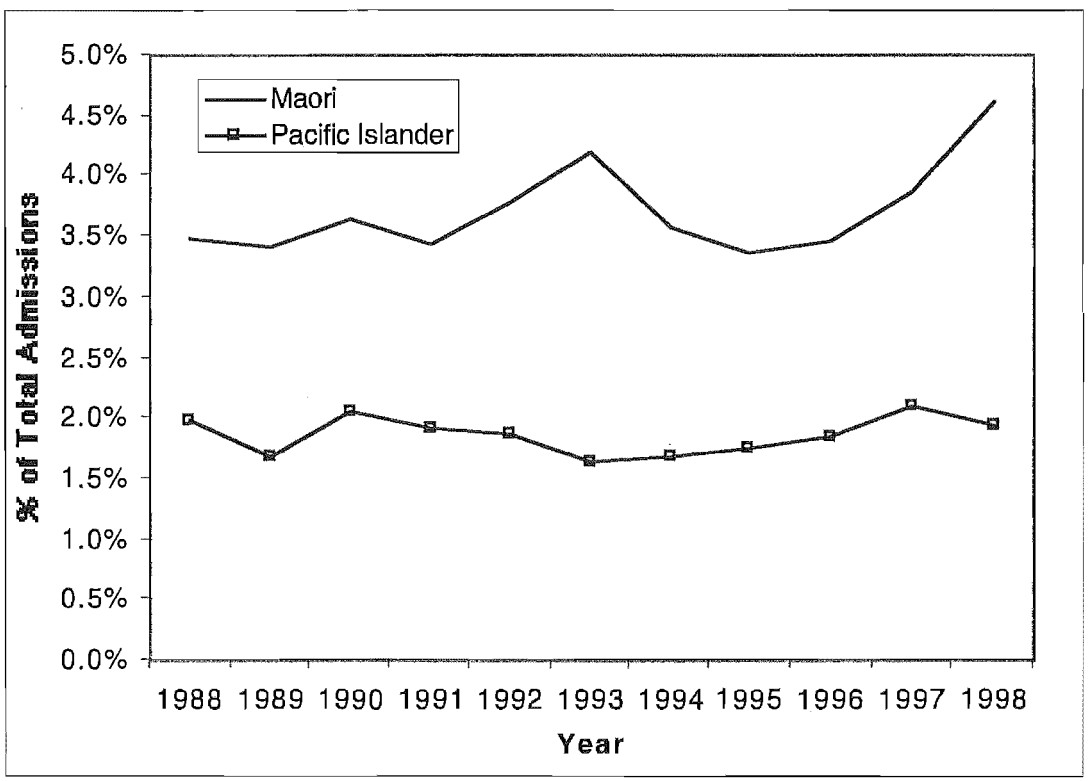
NZDep Decile	Very High		High		Medium		Low		Very low		Total
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	
Maori %	3	5	7	6	7	10	11	14	18	19	6.9
Pacific Island %	1	2	2	5	7	9	11	14	21	27	1.9

Source: Aggregated from meshblocks in Christchurch, SuperMap 3

As examined in Chapter Three, we would expect to see a higher than normal admission rate for minorities. Jackson (1999) found that within a given deprivation level, especially for the more deprived deciles, non-Maori non-Pacific Island people have higher discharge rates than either Maori or Pacific Island people. More interesting was that for people living in areas of decile 8-10, non-Maori non-Pacific Islander people have a 30% higher hospital discharge rate than Maori and Pacific Island people combined. Jackson presents three possible reasons – firstly there may be a systematic undercount in hospital admissions data for Maori and Pacific Island people compared with the Census data (i.e. a data problem – a mismatch of denominator and numerator). This can be attributed to system problems in recording ethnicity, or a mismatch between what people record on the census and what they state at the hospital front desk. Secondly, the problem may be real and be an access issue for Maori and Pacific Island people. They may not be seeking the help they need in time; or being referred in time for the help they need; or are not seeking or being treated for serious but non-life-threatening conditions that would benefit from hospital treatment; or they are dying before they can "achieve" the same level of hospital usage. And thirdly the problem may be real; non-Maori non-Pacific Island people may have worse health status than either Maori or Pacific Island people within the

same deprivation level. This would seem to contradict other health findings and is less likely.

Admissions by Christchurch residents of Maori and Pacific Island backgrounds did not differ greatly in the 1988 – 1998 period. As depicted in figure 5.16 Maori hospital admission increased both in 1997 and 1998. However it can be argued that this is due to the structural changes in recording ethnicity, than in an actual rise of admissions. As discussed previously in Chapter 3, the Health Funding Authority has had a long standing problem in obtaining accurate data on Maori mortality and hospital admissions, due to inconsistency in the ways in which people identified as Maori by hospital staff, and the tendency to under-report people as Maori (Te Puni Kokiri 1993). Recent changes to ethnicity, including self-identified ethnic origin is more likely to have increased the noted admissions of Maori and Pacific Islander. It is likely that Maori made up a far greater percentage of admissions than is stated.



Source: NZHIS MDS

Figure 5.16: Total admissions, Maori and Pacific Islander, Christchurch residents, Christchurch Hospital, 1988 – 1998.

5.4 Summary

The objective of Chapter Five was to examine how the composition of admissions to Christchurch Hospital has changed over the last 10 years. It was intended to (i) describe the broad changes in admissions and (ii) compare these changes in admissions to deprivation indices. First it was noted that the admission dataset was hospital based and not area based, as we wanted to be able to relate the admissions to the broader trends of hospital restructuring. We found that total hospital admissions had increased over the 10 year study period, mirroring increases seen nationally. Christchurch residents made up around 70% of these admissions. Day-patient admissions increased fourfold over the study period. Acute admissions rose to a peak of 75% of total admissions in 1993 and dropped back to 60% of total admissions in 1998. Two common health status measures – avoidable and ambulatory sensitive admissions both rose over the study period, again mirroring changes in other parts of the country.

An examination of total admissions in to Christchurch Hospital by Christchurch residents, broken down by socio-economic groups showed some interesting results. Both the very lowest and very highest groups admission decreased as a percentage of total admissions, while the middle groups increased there share of admissions. Of mores interest was the decline in average length of stay, with individuals from the highest socio-economic group staying an average of 10% longer than residents from the lower socio-economic groups. Also of note was the drop average length of stay for the highest socio-economic groups around the period when part-user charges were implemented.

Chapter Five has shown us that the broad trend in admissions at Christchurch Hospital have mirrored national trends. Furthermore, this chapter has validated the premise that admission will increase across the socio-economic gradient. Chapter Six will explore in more depth the composition of admissions to Christchurch Hospital, focusing on the 1991 and 1996 periods.

CHAPTER SIX

CHRISTCHURCH CASE STUDY – COMPARING ADMISSIONS BETWEEN 1991 AND 1996

6 Introduction

Chapter Five examined the broad tends in admissions at Christchurch Hospital over the 1988 – 1998 period. Specifically, we looked at the percentage increase in admissions and the percentage increase in the share of different categories. The objective of Chapter Six is to further examine the composition of admissions to Christchurch Hospital, focusing on the changes between 1991 and 1996. In particular, the objective is to examine in detail how admissions have risen in relation to deprivation and socio-economic groups between 1991 and 1996.

6.1.1 Total admissions

Total admissions of Christchurch residents into Christchurch Hospital had risen from 14633 in 1991 to 27269 in 1996 – nearly a two-fold increase. In the same period Christchurch's population had risen only 7%. More importantly, as described in Chapters Three and Four, the lower the socio-economic status the higher the expected rate of admission. As shown in table 6.1 below, not only is there an increase in total admission rates, but the lowest socio-economic group admission rate is twice what it was in 1991. More notably the admission rate for decile 10 is twice that of decile 1, and the lower socio-economic deciles have experienced a greater rate of change than the higher socio-economic deciles.

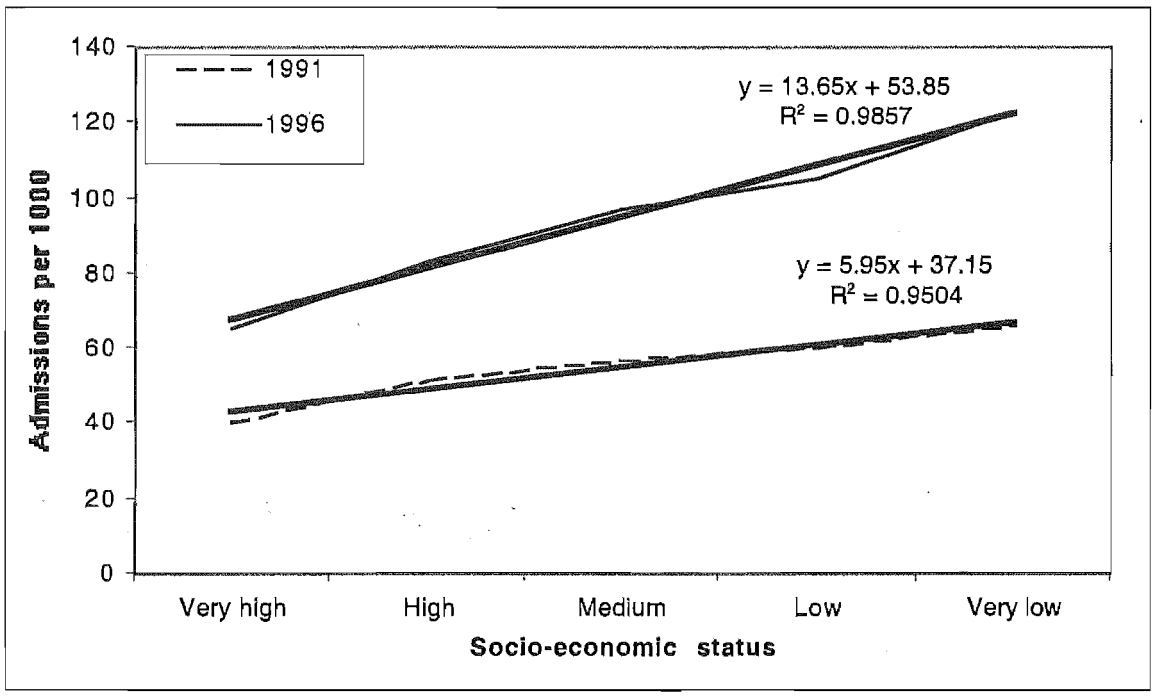
Table 6.1: Total admissions per 1000, Age standardised, Christchurch Residents, Christchurch Hospital, 1991 vs 1996

NZDep Decile	1	2	3	4	5	6	7	8	9	10
1991	38	43	50	53	55	59	59	61	65	67
1996	58	73	80	87	92	102	98	112	122	124
Change	53%	70%	60%	64%	67%	73%	66%	84%	88%	85%

Source: NZHIS MDS

As is illustrated in Table 6.1, in 1991, for every decile step up in a deprivation decile there was an 7% increase in hospital admissions. This compares with 1996, where for

every decile step up in a deprivation decile there was an 11% increase in hospital admissions. This is an increase of nearly 60%. Figure 6.1 depicts total admissions in 1991 and 1996 versus grouped socio-economic deciles. This clearly illustrates the usefulness of the deprivation index as a predictor of hospital admissions.



Source: NZHIS MDS

Figure 6.1: Total admissions per 1000, Christchurch Residents, Christchurch Hospital, 1991 vs 1996.

The 1996 variation in deciles mirrors that of Jackson (1999) who has examined total admission rates in South Auckland. He found a 11% increase between deciles, and 2.5 difference between deciles 1 and 10. Examining the six age brackets (0 to 4, 5 to 14, 15 to 24, 25 to 44, 45 to 64 and 65 plus) shows similar results, with each age group experiencing an increased rate of admissions, per decile, as compared to 1991. Table 6.3 demonstrates this increase. Jackson (1999) found the greatest correlation between the 15 – 24, 25 – 44 and 45 – 64 age groups. This may be attributed to disease risks like smoking and obesity which have finished their-pre morbid phase and begun to cause disease. Jackson (1999) also noted that the prevalence of disease begins to rise sharply in the 45 – 64 age group, and that in the 65 plus group socio-economic status becomes a less powerful predictor of health as income levels start to close up, and a

survivor bias can overwhelm current (as opposed to lifetime) measures of socio-economic status.

Table 6.2: Total admissions by age group and decile, Residents of Christchurch, Christchurch Hospital, 1991 vs 1996.

NZDep Decile		1	2	3	4	5	6	7	8	9	10
0 to 4	1991	95	111	120	135	134	120	134	155	140	168
	1996	150	159	195	200	213	255	243	214	265	250
5 to 14	1991	26	29	34	29	38	36	36	42	41	45
	1996	32	43	51	62	63	63	69	65	89	68
15 to 24	1991	22	25	33	28	29	41	33	38	35	35
	1996	34	34	34	40	40	41	32	52	47	67
25 to 44	1991	19	22	25	30	27	34	32	33	35	46
	1996	25	30	39	35	36	44	43	61	68	72
45 to 64	1991	34	37	38	39	49	51	61	52	70	69
	1996	44	56	62	79	90	103	116	120	119	152
65 plus	1991	91	102	126	137	131	144	137	138	147	121
	1996	164	233	231	247	256	274	236	289	303	263

Source: NZHIS MDS

The greatest correlation appears in the 25 – 44 and 44 – 64 age groups, mirroring Jackson's (1999) study of South Auckland. This illustrated as Figures 6.4 – 6.9. As has been shown above, hospital admissions by Christchurch residents into Christchurch Hospital has increased between 1991 and 1996. More importantly the difference in admission rates between the lowest and highest socio-economic groups has increased by nearly 60% over the 1991/1996 period, and this is evident in all age groups. Residents in the lower socio-economic areas are more likely than ever to be admitted to hospital.

Of note is that all age groups have shown increased gradients across the socio-economic groups between 1991 and 1996. The flattening of class gradients among the 65 plus group is puzzling, given that one might reasonably expect the cumulative impact of socioeconomic differentials experienced throughout the life course to

produce *steeper* gradients with increasing years (Ford *et al.* 1994). House *et al.* make the point that socioeconomic inequalities in health may simply be more difficult to identify among elderly populations, given "the fact that the distribution of income within the older aged group is more compressed, combined with the greater overall prevalence of ill-health" (1990: 26).

Figures 6.2 – 6.7: Total admissions by age group and decile, Residents of Christchurch, Christchurch Hospital, 1991 vs 1996.

Source: NZHIS MDS

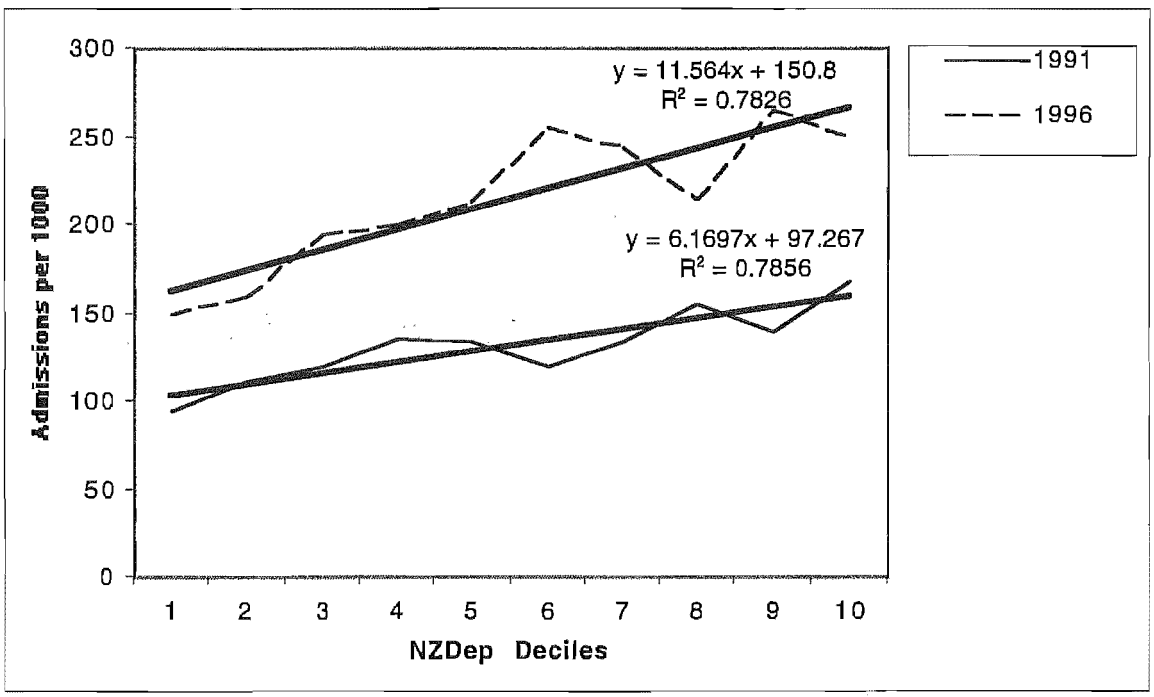


Figure 6.2: 0 – 4 age group

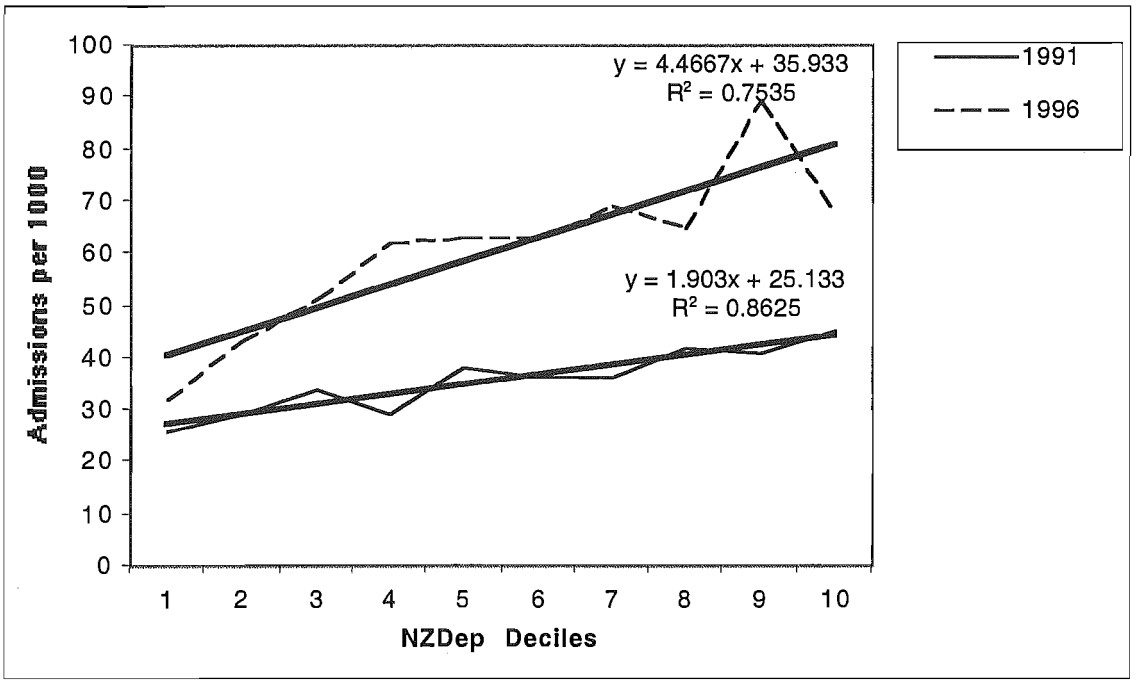


Figure 6.3: 5 - 14 age group

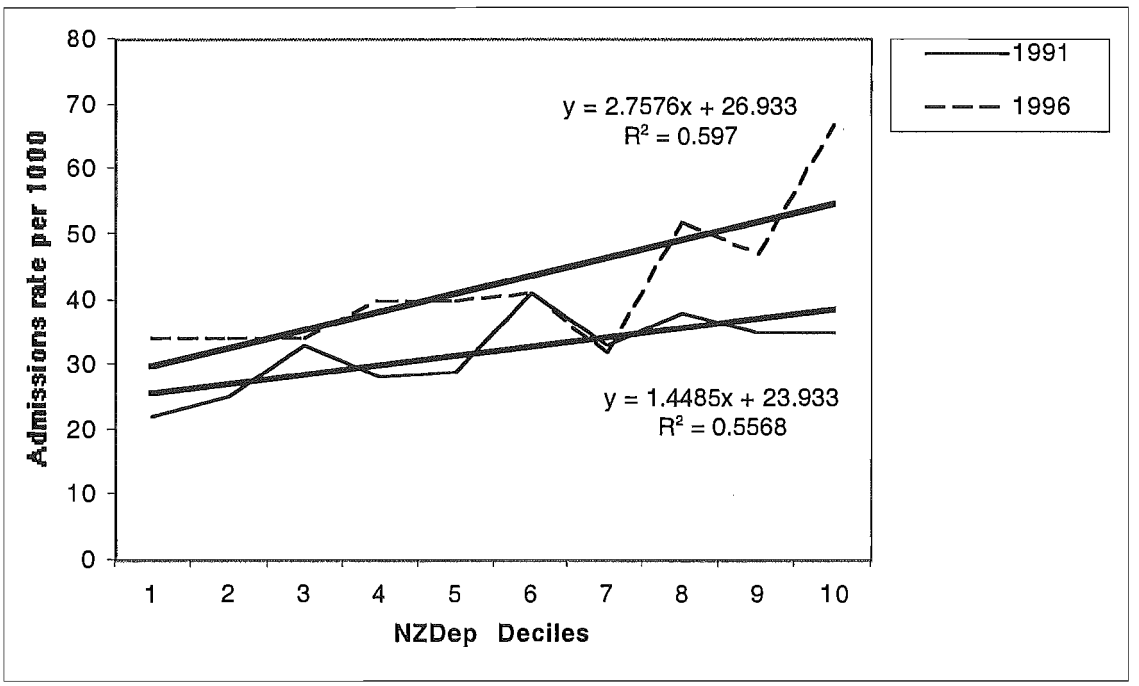


Figure 6.4: 15 – 24 Age group

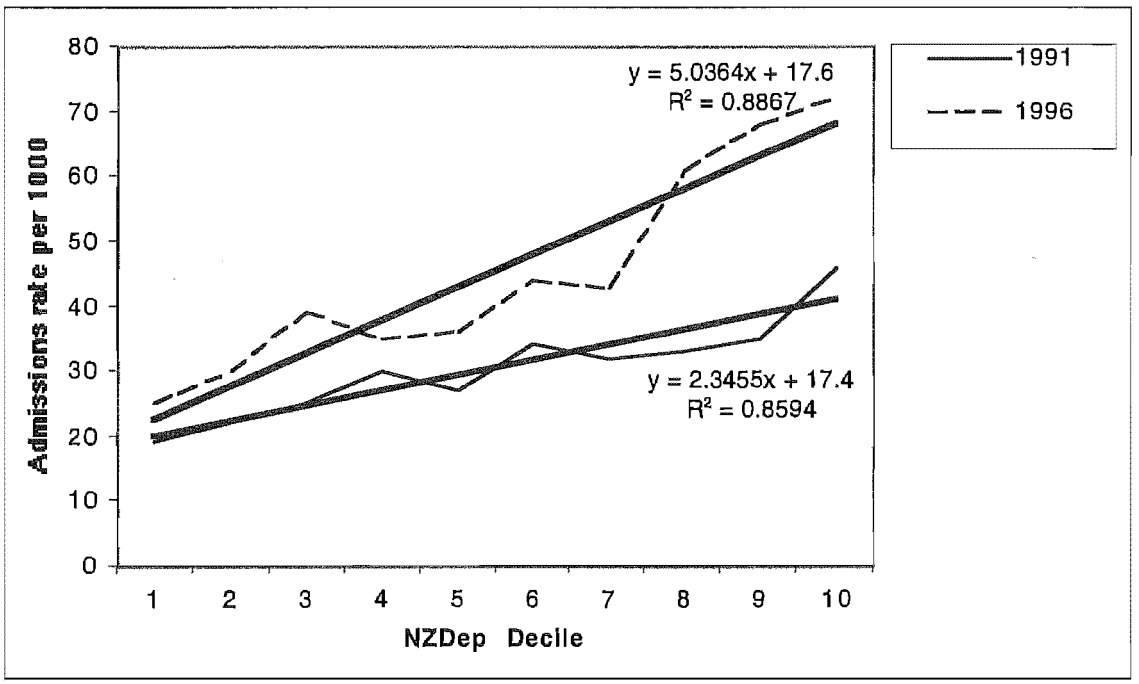


Figure 6.5: 25 – 44 Age group

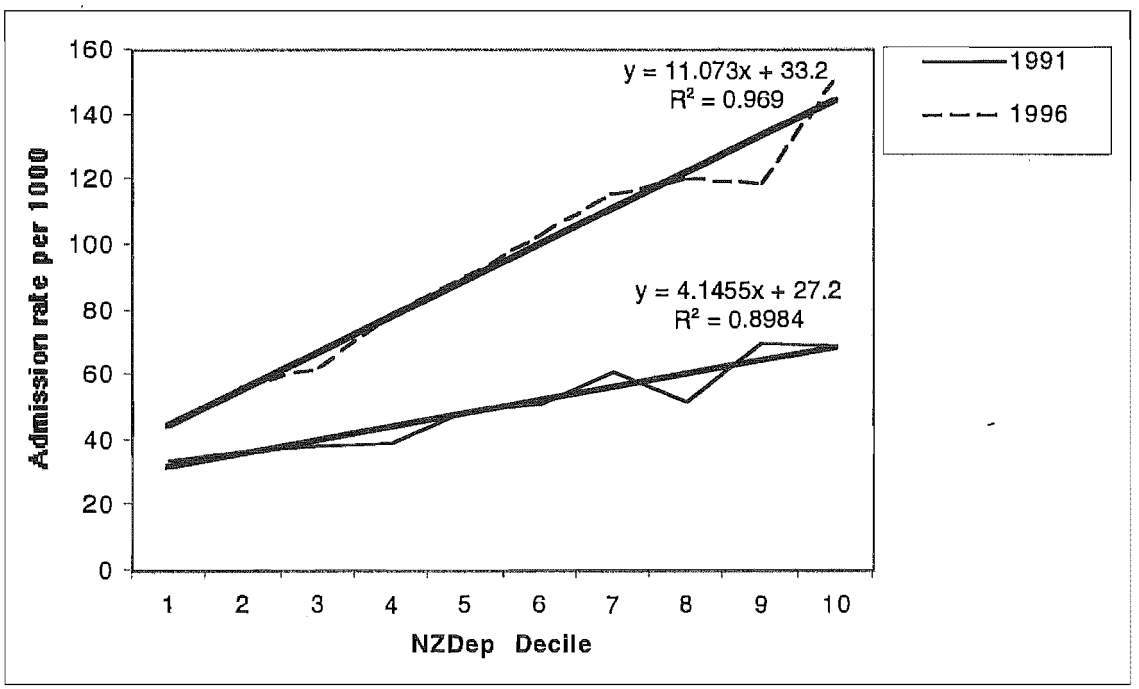


Figure 6.6: 45 – 64 age group

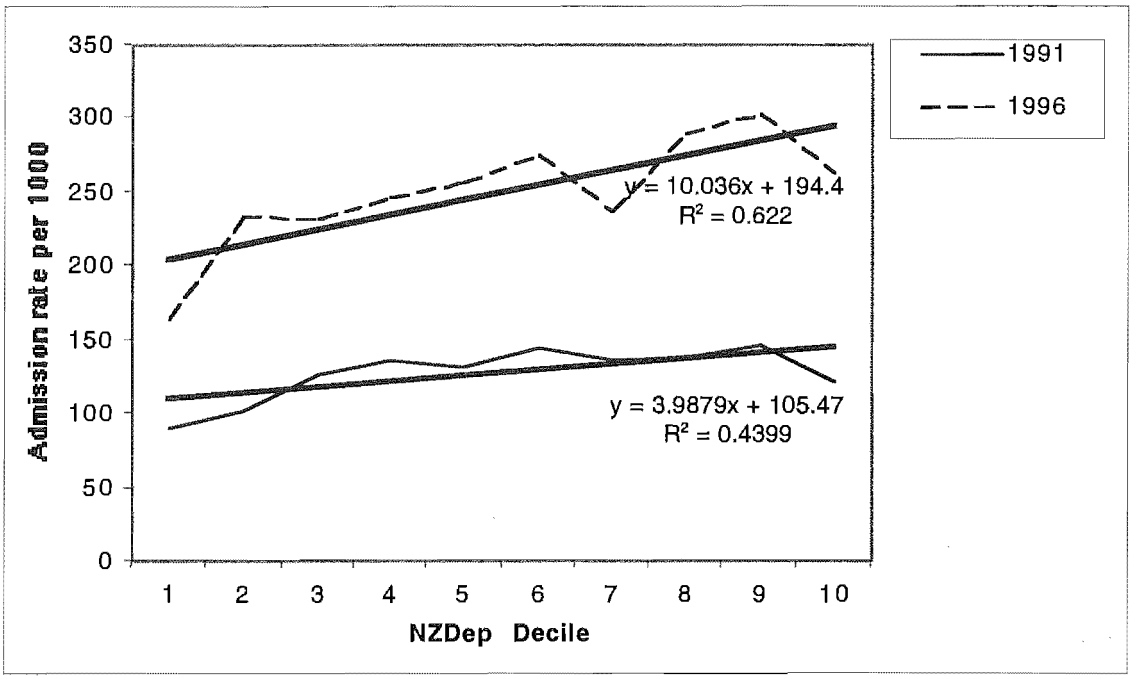
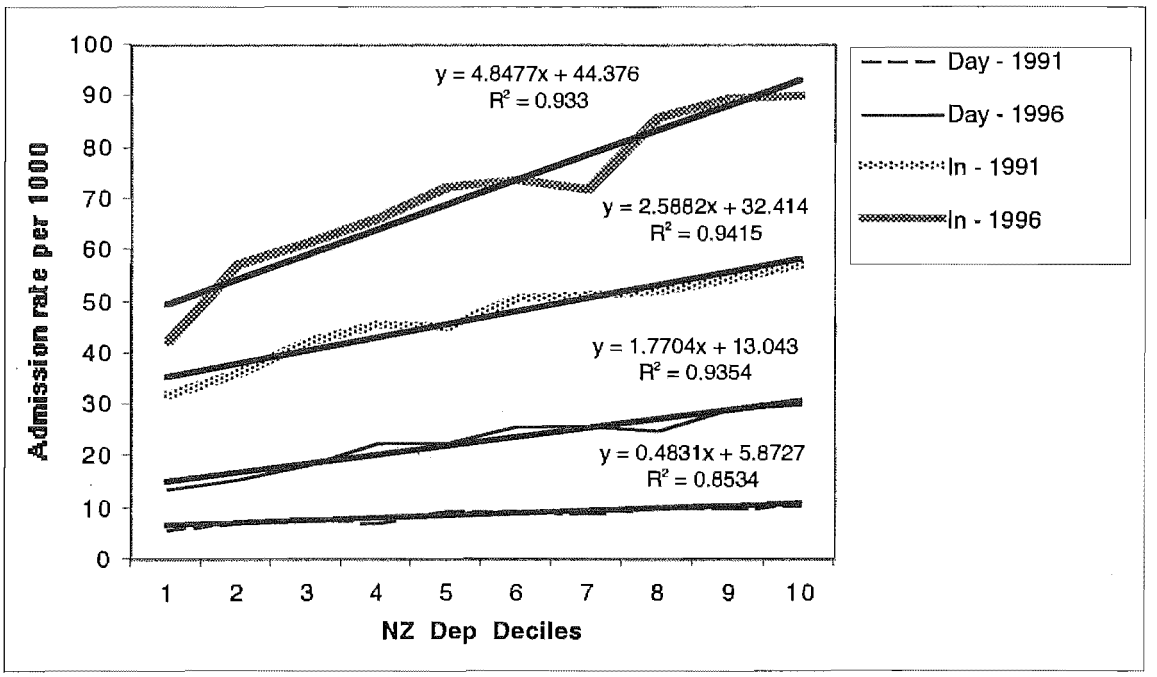


Figure 6.7: 65 plus age group

As has been described in Chapter Five, there has been a fourfold increase in day-patient admissions, increasing from 8% of all admissions to 30% of all admissions in the period 1988 – 1998. When total admissions of day patients was examined in 1991 and 1996, it was found that the lowest socio-economic deciles had increased there rate of admission threefold, while the higher socio-economic decile twofold. Figure 6.8 compares the total day-patient and in-patient admissions, and the increasing gap between the highest and lowest socio-economic deciles can be seen quite clearly.



Source: NZHIS MDS

Figure 6.8: Total admissions, age standardised, day-patients and in-patients, Christchurch residents, Christchurch Hospital, 1991 and 1996

6.1.2 Acute admissions

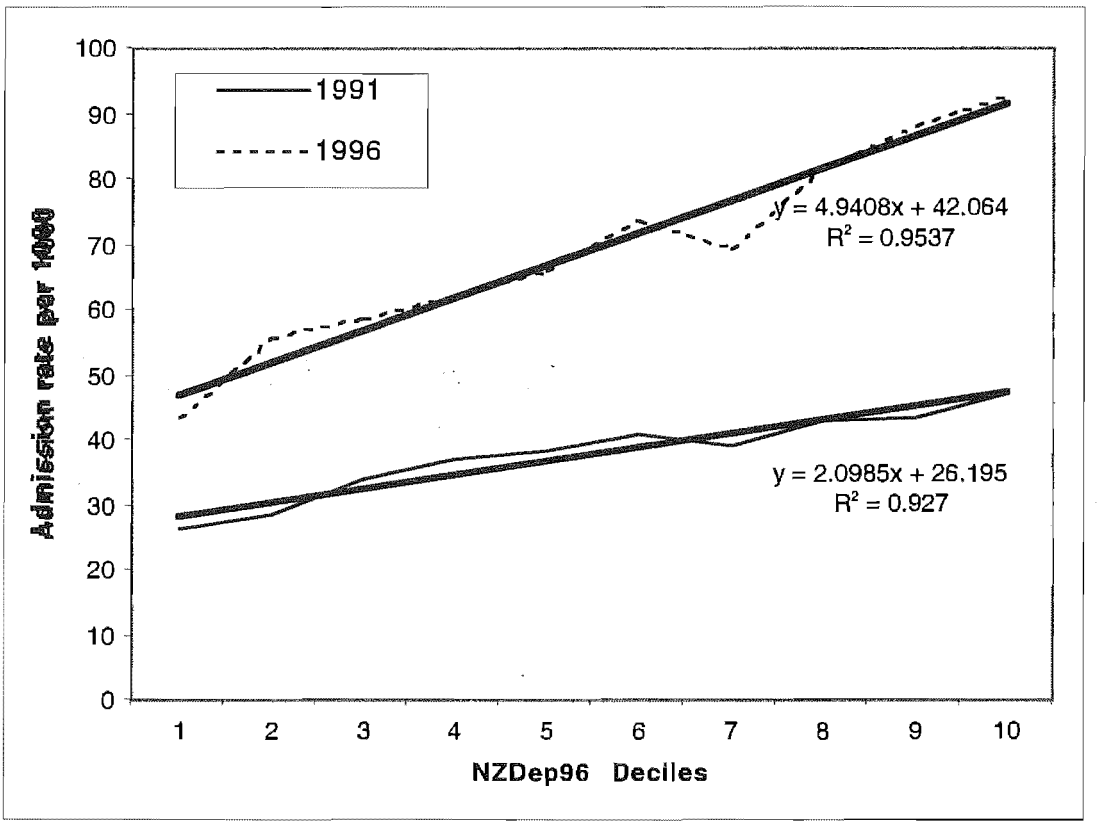
As discussed in Chapter Five, residents from the lower socio-economic areas were 30% more likely to be admitted as a day patient as for acute care than residents from higher socio-economic areas. This pattern remains the same when comparing all acute admissions into Christchurch Hospital.

Table 6.3: Total acute admissions, age standardised, Christchurch residents, Christchurch Hospital, 1991 and 1996

	1	2	3	4	5	6	7	8	9	10
1991	26	28	34	37	38	41	40	44	44	49
1996	42	55	59	63	67	72	70	81	87	91
Change %	62	95	75	72	79	74	74	86	98	85

Source: NZHIS MDS

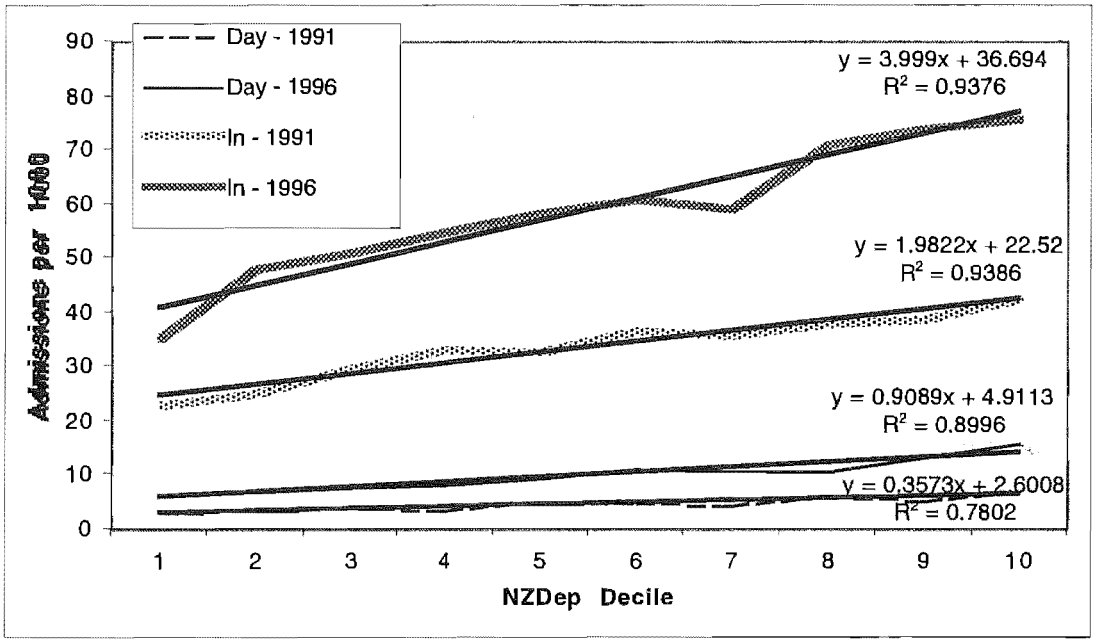
As seen in Table 6.3 Christchurch residents from the lower socio-economic areas are twice as likely to be admitted to Christchurch Hospital as are residents from the higher socio-economic areas. In 1991, for every step in deprivation, there is a 2.1% increase in acute hospital admissions. In 1996, for every step in deprivation, there is a 4.9% increase in acute hospital admissions – over a 100% increase from 1991. This is graphically demonstrated in Figure 6..



Source: NZHIS MDS

Figure 6.9: Acute admissions per 1000, age standardised, Christchurch residents, Christchurch Hospital, 1991 and 1996

When in-patient and day-patient acute admissions are compared, as in Figure 6.10, a similar increase in deciles is seen. Both in-patient and day-patient acute admission rates have risen, with the lower socio-economic groups experiencing a larger increase.



Source: NZHIS MDS

Figure 6.10: Acute admissions per 1000, age standardised, day-patient and in-patient, Christchurch residents, Christchurch Hospital, 1991 and 1996

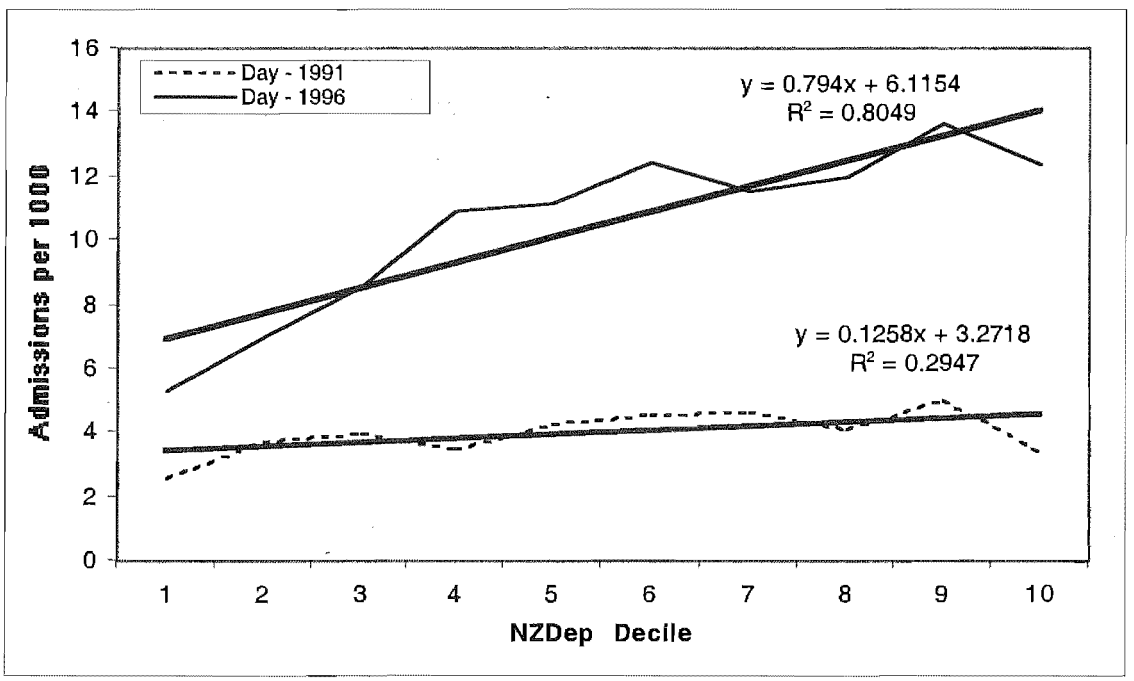
6.1.3 Elective admissions

As can be seen in Table 6.4 1996 elective in-patient admissions have actually dropped while day-patient admissions have risen. Elective day-patient standardised admission rates have risen considerably since 1991. The socio-economic grade has also increased twofold. Figure 6.11 graphically depicts this. We are not seeing the same pattern in elective in-patient standardised admission rates. As Figure 6.12 shows the socio-economic gradient has stayed about the same.

Table 6.4 Elective admissions, day –patients and in-patients, Christchurch residents, Christchurch Hospital, 1991 – 1996

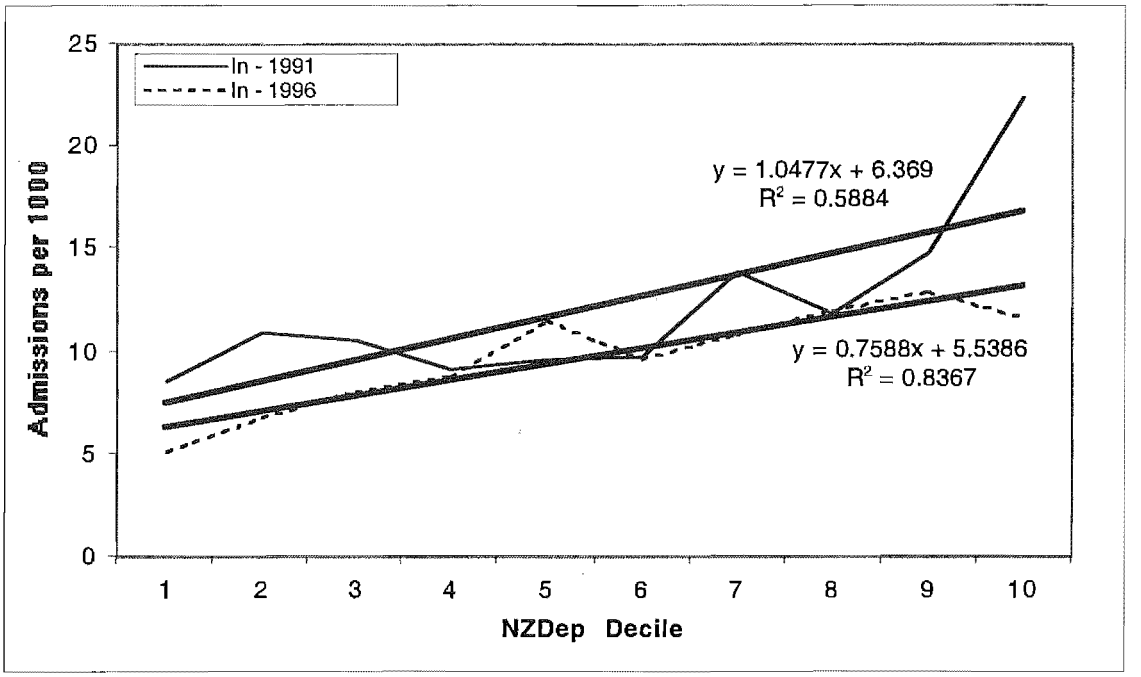
	NZDep Deciles									
	1	2	3	4	5	6	7	8	9	10
1996 In-patient	200	246	267	298	326	290	282	347	396	200
1991 In-patient	200	395	349	310	273	295	362	344	452	385
1996 Day-patient	207	253	282	369	315	379	301	350	418	212
1991 Day-patient	93	128	110	88	95	94	107	100	144	88

Source: NZHIS MDS



Source: NZHIS MDS

Figure 6.11: Elective admissions per 1000, age standardised, day-patients, Christchurch residents, Christchurch Hospital, 1991 and 1996



Source: NZHIS MDS

Figure 6.12: Elective admissions per 1000, age standardised, in-patients, Christchurch residents, Christchurch Hospital, 1991 and 1996

6.1.4 Avoidable and ambulatory sensitive admissions

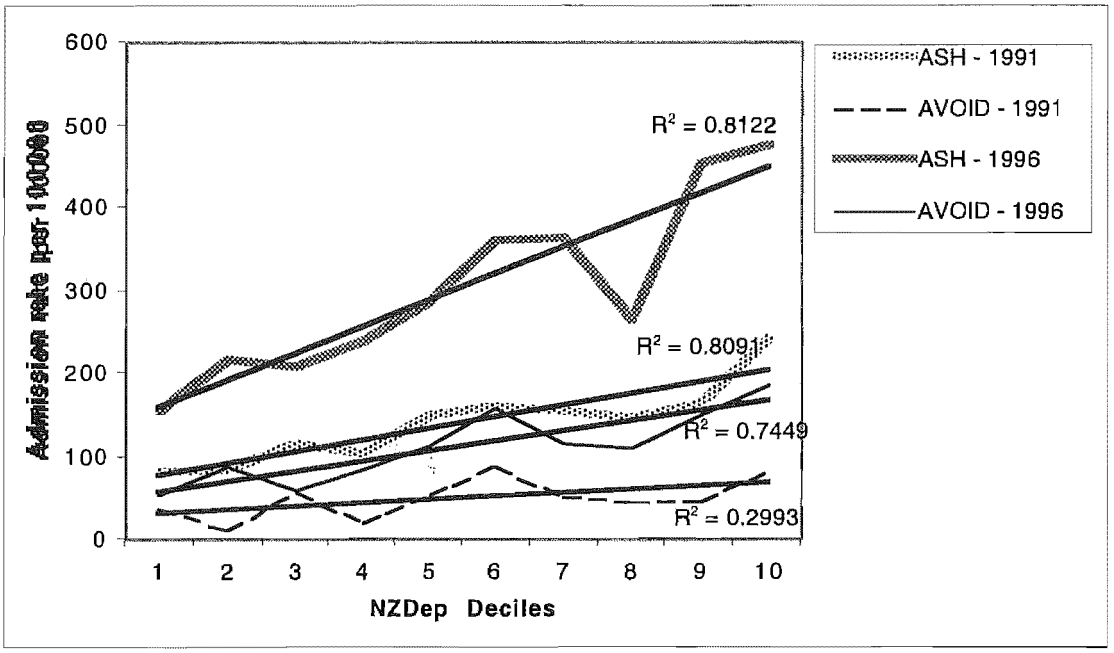
As has already been discussed in Chapter Five, we have seen that avoidable admissions make up approximately 10% of all admissions and ambulatory sensitive hospitalisations comprise 14% to 18.5% of all hospital admissions. Over the 1989 – 1997 period both avoidable and ambulatory sensitive hospitalisations had increased three fold per 100000 population. Table 6.5 outlines the change in avoidable and ambulatory sensitive admissions in 1991 and 1996. As can be seen, admission rates have increased an average of 150% of that period.

Table 6.5: Ambulatory sensitive and avoidable admissions, admission rate per 100000 Christchurch residents, Christchurch Hospital, 1991 and 1996

NZDep	1	2	3	4	5	6	7	8	9	10
Ambulatory sensitive admissions										
1991	374	497	640	685	602	875	810	790	862	1253
1996	899	1434	1483	1582	1759	1964	1921	2081	2598	2462
Change %	141	189	132	131	192	124	137	163	201	97
Avoidable admissions										
1991	279	322	395	394	359	518	491	485	459	650
1996	553	797	760	947	1010	1043	1001	1137	1411	1461
Change %	98	148	92	140	181	101	104	134	208	125

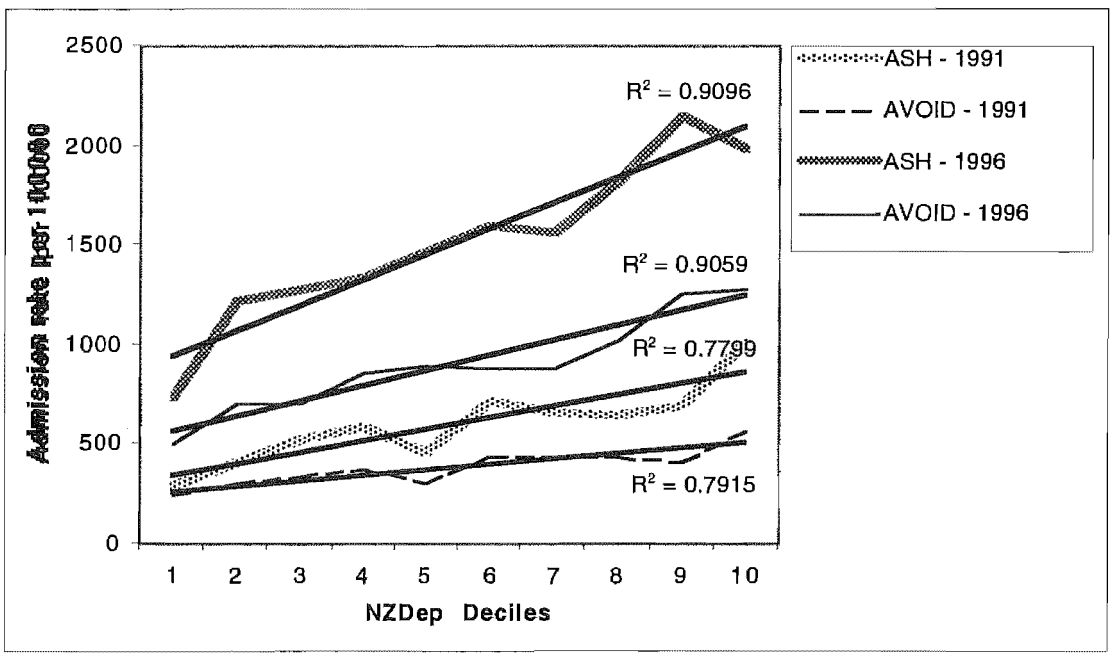
Source: NZHIS MDS

Figures 6.13 and 6.14 show the difference between in-patient and day-patient admissions using the avoidable and ambulatory sensitive categories. Again we are seeing a strong correlation in admissions as the deprivation decile becomes higher. A study of ambulatory sensitive admissions in North Health region (Jackson *et al.* 1998) showed similar results. Ambulatory sensitive admissions rose quite steeply after 1993 suggesting a linkage with the new health reforms enacted at that time.



Source: NZHIS MDS

Figure 6.13: Ambulatory sensitive and avoidable admissions, day-patient admission rate per 100000 Christchurch residents, Christchurch Hospital, 1991 and 1996



Source: NZHIS MDS

Figure 6.14: Ambulatory sensitive and avoidable admissions, in-patient admission rate per 100,000 Christchurch residents, Christchurch Hospital, 1991 and 1996

As shown in Figure 6.13 and 6.14 there is also a clear and distinct pattern of ambulatory and avoidable hospitalisation rates across the socio-economic groups. Admission rates have increased twofold over the 5 year period, and the difference in rates between deciles had become greater. This suggests that people in the lower socio-economic groups are not accessing the health care necessary to avoid hospitalisation (Jackson *et al.* 1998).

6.1.5 Selected conditions – asthma and diabetes

We have seen that there has been a rise in ambulatory and avoidable hospitalisation rates between 1991 and 1996. Tables 6.6 and 6.7 compare specific conditions related to ambulatory and avoidable hospitalisation.

Table 6.6: Avoidable admissions by condition, all admissions, Christchurch Hospital, Christchurch residents, 1991 and 1996

Avoidable admissions 1996	Number of discharges for period	Age standardised admission rate for socio-economic group				
		Very High	High	Medium	Low	Very Low
ASTHMA	*1035*	*209*	*288*	*329*	*398*	*573*
CELLULITIS	310	74	69	117	123	161
CONGESTIVE HEART FAILURE	400	107	118	155	120	168
DIABETES	43	11	12	14	11	25
GANGRENE	6	0	5	3	2	0
HYPOKALEMIA	1	0	0	0	0	3
IMMUNIZABLE CONDITIONS	20	1	7	5	18	2
KIDNEY INFECTIONS	90	21	27	25	26	50
PEFORATED OR BLEEDING ULCER	100	35	33	26	27	45
PNEUMONIA	887	199	271	321	324	401
RUPTURED APPENDIX	64	18	24	32	19	9

Avoidable admissions 1991	Number of discharges for period	Age standardised admission rate for socio-economic group				
		Very High	High	Medium	Low	Very Low
ASTHMA	*476*	*116*	*118*	*154*	*153*	*179*
CELLULITIS	113	27	43	53	35	21
CONGESTIVE HEART FAILURE	132	44	58	55	46	64
DIABETES	16	3	3	2	4	14
GANGRENE	5	3	3	2	0	0
HYPOKALEMIA	1	1	0	0	0	0
IMMUNIZABLE CONDITIONS	37	7	4	2	18	23
KIDNEY INFECTIONS	38	6	3	12	26	21
PEFORATED OR BLEEDING ULCER	63	20	29	22	13	26
PNEUMONIA	228	58	81	79	74	79
RUPTURED APPENDIX	42	16	17	15	8	12

Table 6.7: Avoidable admissions by condition, all admissions, Christchurch Hospital, Christchurch residents, 1991 and 1996

Ambulatory sensitive admissions	Number of discharges for period	Age standardised admission rate for socio-economic group				
1996		Very High	High	Medium	Low	Very Low
ANGINA	676	161	214	280	232	247
ASTHMA	*1035*	*209*	*288*	*329*	*398*	*573*
CELLULITIS	329	77	70	119	136	178
CONGESTIVE HEART FAILURE	401	107	118	155	120	169
CORD	587	100	163	209	264	259
DEHYDRATION/VOLUME DEPLETION	22	7	10	7	11	0
DENTAL CONDITIONS	53	6	13	17	31	25
DIABETES	*43*	*11*	*12*	*14*	*11*	*25*
ENT AND URT INFECTIONS	565	120	165	176	210	297
EPILEPSY	170	29	64	59	42	101
FAILURE TO THRIVE	32	8	7	7	18	17
GASTROENTERITIS	130	32	34	40	68	49
HYPERTENSION	28	11	3	8	11	11
IMMUNIZATIONRELATED/PREVENTABL	19	1	7	5	16	2
IRON DEFICIENCY	51	15	15	16	29	12
KIDNEY/URINARY INFECTION	305	76	93	103	95	146
OTHER TUBERCULOSIS	8	0	4	2	0	8
PID	15	3	3	7	3	11
PNEUMONIA	836	190	246	304	302	390
1991						
ANGINA	16	1	8	10	6	7
ASTHMA	*476*	*116*	*154*	*179*	*197*	*259*
CELLULITIS	131	28	60	28	67	61
CONGESTIVE HEART FAILURE	133	44	55	64	44	45
CORD	127	20	44	73	56	57
DEHYDRATION/VOLUME DEPLETION	2	0	4	0	0	0
DENTAL CONDITIONS	33	3	8	16	13	22
DIABETES	*16*	*3*	*2*	*14*	*6*	*8*
ENT AND URT INFECTIONS	350	74	114	117	151	215
EPILEPSY	54	7	30	18	11	37
FAILURE TO THRIVE	15	4	2	0	6	15
GASTROENTERITIS	147	41	32	54	46	102
HYPERTENSION	6	0	0	5	4	4
IMMUNIZATIONRELATED/PREVENTABL	25	7	2	16	13	11
IRON DEFICIENCY	21	7	4	14	11	6
KIDNEY/URINARY INFECTION	140	21	64	47	56	76
OTHER TUBERCULOSIS	6	0	0	0	2	9
PID	7	0	2	5	2	6
PNEUMONIA	226	58	75	79	100	113

Source: NZHIS MDS

As can be seen in Tables 6.6 and 6.7 in just about every condition, there is a positive correlation with deprivation. Two conditions have been selected for further examination – asthma and diabetes. Both these conditions require access to good primary and secondary care (Jackson *et al.* 1998). Table 6.8 shows admission rates for asthma and diabetes in 1991 and 1996.

Table 6.8: Comparison of admission rates, all admissions, Christchurch Hospital, Asthma and diabetes, Christchurch residents, 1991 and 1996

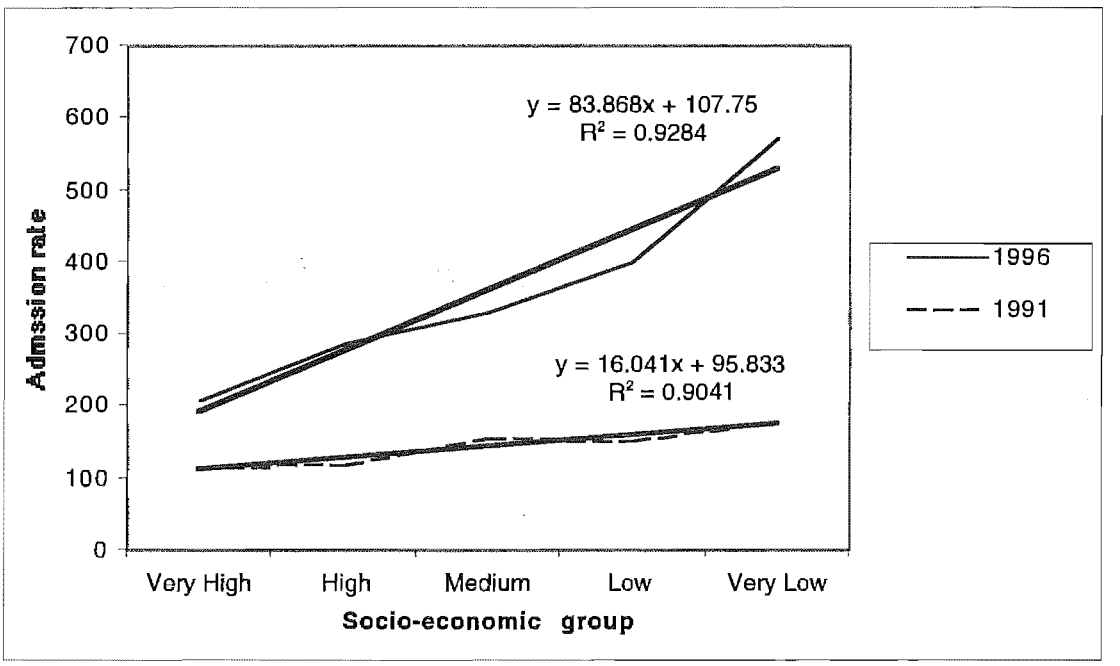
Admission type	Total	Age standardised admission rate for socio-economic group per 100,000				
		Very High	High	Medium	Low	Very Low
Asthma 1996	1035	209	288	329	398	573
Asthma 1991	476	116	118	154	153	179
Diabetes 1996	43	11	12	14	11	25
Diabetes 1991	16	3	3	2	4	14

Source: NZHIS MDS

Extensive research has been undertaken, both in New Zealand and overseas, that has found large differences in socio-economic status for asthma hospitalisations. A national study into asthma mortality identified a three-fold variation in mortality rates by health district for a two-year period in the early 1980s (Sears *et al.* 1985). It was speculated that there were regional differences in prevalence, severity or management of asthma. A study that examined asthma mortality by CAU for all New Zealand (1976-1985) found that 2.3 times as many persons dies from asthma in low socioeconomic area as in high socioeconomic areas (Jackson 1988) (using the HEQ classification by Reinken *et al.* 1985). Possible differences in access to appropriate asthma management, and lack of asthma education by socioeconomic group, were raised as possible explanations for the variation in mortality rates detected. The prevalence of asthma has also been investigated a the sub-regional level using written and 'video' questionnaires administered to residents in Wellington, Lower Hutt and Porirua (Robson *et al.* 1993). This study found no significant differences between the prevalence of asthma symptoms in these three areas. As such it was able to suggest

that differences in asthma death rates between Wellington and Lower Hutt reported previously (Sears *et al.* 1985) were unlikely to have resulted from actual differences in the prevalence or severity of asthma among the children.

Several factors have been identified as exacerbating asthma, and can be related to socio-economic status. Dampness and overcrowding may increase house dust mites and other allergens that aggravate asthma. As is illustrated in Figure 6.15 the incidence of asthma correlates with an increase in deprivation.



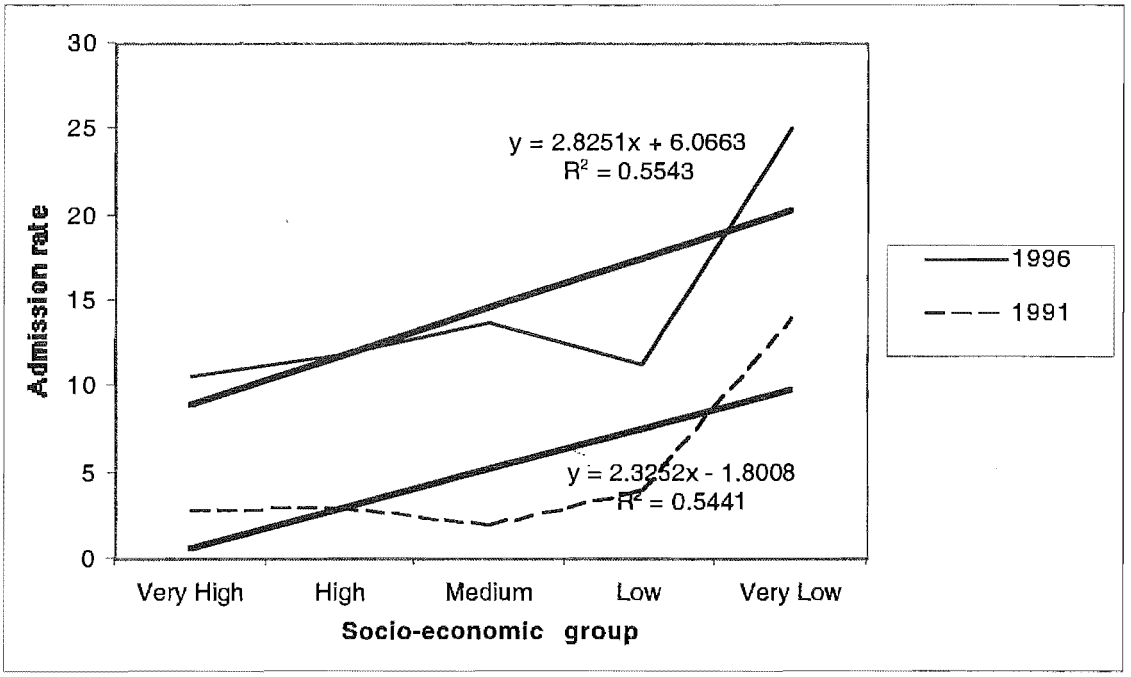
Source: NZHIS MDS

Figure 6.15: Admission rate, age standardised, asthma, Christchurch residents, socio-economic group, 1991 and 1996

Particularly marked is the increase in the gradient between 1991 and 1996. In 1991 there was a 1.5 increase in admissions between the lowest and highest socio-economic groups and in 1996 this rose to 2.5 times. Jackson's (1999) study of South Auckland found a twofold difference and Jackson *et al.* (1998) study of the North Health region found a 2.3 times increase in asthma admissions between the least and most deprived groups.

Diabetes is a major health problem and one that contributes to a disproportionate number of hospital admissions, in both New Zealand and overseas (Brown and Barnett 1992). A spatial analysis of diabetes prevalence in hospital board districts was undertaken using 1971 Census data which included a question on diabetes treatment (Borman 1980). This analysis indicated a spatial distribution that was considered likely to relate to the distribution of the Maori population. More recently, geographic variation is apparent from calculations of the standardised hospital discharge rate for ketoacidosis and diabetic coma in 1994 in RHA regions (Wilson *et al.* 1996). There is some New Zealand evidence that at a regional level, marked year-to-year fluctuations in risk of insulin-dependent diabetes mellitus (IDDM) can occur (Brown 1993). Brown and Barnett (1992) found that hospital admissions by individuals with diabetes had more to do with the availability of medical resources than to socio-demographic characteristics of the area. Jackson *et al.* (1998) found that diabetes is more prevalent in the lower socio-economic groups, but point out that it is possible that socio-economic status is merely acting as a surrogate for ethnicity, as this condition is particularly prevalent among Maori and Pacific Islanders.

Diabetes admissions at Christchurch Hospital by Christchurch residents showed a slight correlation with socio-economic group. As is seen in Figure 6.16 this relationship has become slightly stronger in 1996. In the North Health region Jackson *et al.* (1998) found that hospitalisation rates were twice as high among the 'very low' group as it was for the 'very high' group. In South Auckland (Jackson 1999) the difference was three fold – this may be attributed to the high percentage of Maori and Pacific Islander's in the South Auckland region.



Source: NZHIS MDS

Figure 6.16: Admission rate, age standardised, diabetes, Christchurch residents, socio-economic group, 1991 and 1996

6.1.6 Examining acute admissions at CAU level

Although we have seen a very good correlation between deprivation and acute using deprivation deciles as a measure, it is not as good when using Census Are Units (CAU's) as a measure. Appendix Four list all the CAU's in Christchurch and the age standardised rate of total acute admissions. Figure 6.14 shows all the CAU's in Christchurch, colour coded by deprivation, and each CAU's change in the rate of acute admissions. As can be seen there is no logical order between change in acute hospital admissions and CAU populations. This can be attributed to the problem of aggregating deprivation data from meshblock to CAU, as explained in Chapter Four. As a CAU can contain meshblocks with many different deprivation deciles you are not getting an accurate measure of the whole CAU population. The magnitude of differences in hospitalisation rates between localities depends on how the data are analysed and how many years of data are used. Recent research has suggested that hospitalisation rates across small geographic areas may vary substantially less than some studies have reported (Schwartz *et al.* 1994).

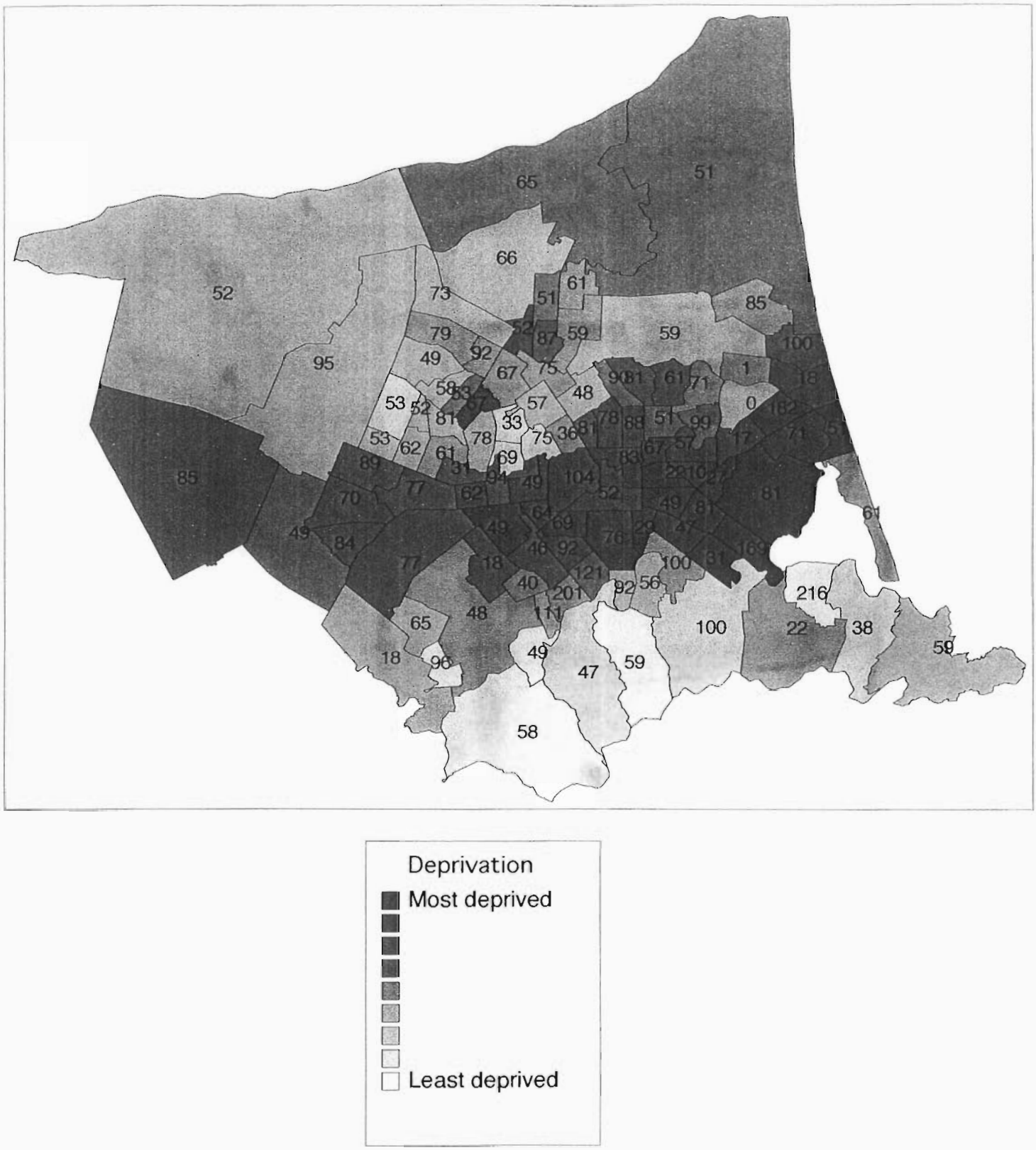


Figure 6.17: Total acute admissions, rate per 1000, Census Area Units, Christchurch residents, Christchurch Hospital, 1996

6.2 Summary

The objective of Chapter Six was to further examine the composition of admissions to Christchurch Hospital, focusing on the changes between 1991 and 1996. Total admissions into Christchurch Hospital by Christchurch residents had nearly doubled, despite the population of Christchurch only increasing by 7%. The socio-economic gradient showed a twofold increase between 1991 and 1996. This would lead us to conclude that inequality has increased between the higher and lower socio-economic groups. When admissions were split up by age groups, similar results were found. All age groups had increased admissions, and the differential between the higher and lower socio-economic groups had increased. Of note was the flatter gradient for the 65 plus age group, and could not be explained.

Both day and in-patient admissions had increased, with the difference between the higher and lower socio-economic groups increasing between 1991 and 1996. Across different admission types (acute, elective, avoidable and ambulatory sensitive) saw the same results – increases in the difference between the higher and lower socio-economic groups between 1991 and 1996. Asthma and diabetes were selected to illustrate the admission rates for selected conditions that required access to good primary and secondary care. Asthma admission rates had increased, and the now familiar socio-economic gradient was present. The correlation for diabetes was not as good, but still increased along the socio-economic gradient. Finally, admission were correlated to CAU level, where mixed results were found.

CHAPTER SEVEN

CONCLUSIONS

7 Introduction

This chapter will consider the findings of the previous chapters and how the relate to the two research objectives that were outlined in Chapter One and complete a summary of the main findings. Then it will discuss some of the implications of the results and outline some suggestions for further research.

7.1 Re-examination of the research objective

Firstly the thesis attempted to understand and identify the current patterns and processes in health and deprivation, both in a New Zealand context and at an international scale. We identified a number of issues involved in the defining and measuring of health, inequality, poverty and deprivation. Each term can be broadly interpreted and can overlap at some stage with each other. This interpretation is a common theme throughout the literature. We found that there is substantial evidence that health status is highly correlated with socio-economic status. The literature has told us that individuals from the lower socio-economic classes are more likely to be admitted to hospital.

The relationship between socioeconomic status and health typically takes the form of a curvilinear gradient, with increments in socio-economic status precipitating successively smaller gains in health status as one ascends the socioeconomic strata. Similar trends are seen in the relationship between ethnicity and health. We have seen in New Zealand the health experience of Maori reflecting what is broadly accepted as an international tendency in the relationship between ethnicity and health. The nature of space, time and place is inherent in the discussion of health variations. There is extensive evidence which support the argument that contextual health effects associated with place and space may contribute to health variation with three types of theoretical framework; spatial patterning and diffusion of physical and biological risk factors; social relations; and sense of place.

The issue of health inequality is becoming more politicised, as it effects a greater percentage of the population. In the run up to the general elections this year, political parties are identifying health equality issues as a major policy platform. Furthermore, reports on the growing inequality within the health sector have prompted agencies to investigate further (see for example Jackson *et al.* 1998, Howden-Chapman *et al.* 1998, National Health Committee 1998).

Secondly, the thesis aimed to determine the extent to which neighborhood socio-economic status can predict variations in hospital admissions. Across the different admission types (acute, elective, avoidable and ambulatory sensitive) and age groups we saw the same results – increases in the difference between the higher and lower socio-economic groups between 1991 and 1996. More importantly, the socio-economic gradient had increased leading us to conclude that the increase in deprivation has been reflected by a increase in hospital admissions. We found that in most cases there is a direct relationship between deprivation (as measured by the NZDep index) and hospital admissions.

7.2 Implications of the results

Those New Zealanders who are unable to afford private health insurance are having to wait for treatment, often with a consequent deterioration in their health and an associated financial and social burden. In a comprehensive study of the North Health region by Jackson *et al.* (1998) it had been estimated that if avoidable hospitalisation rates (that is conditions that are normally easily treated with primary health care) of individuals in the lowest socio-economic groups were reduced to that of the middle groups, then around 950 admissions per year might have been averted. This represents around $2.2m per annum, based on average hospital costs. If all groups had the same rate as individuals in the highest socio-economic groups, then about 2,900 admissions per year might have been saved, representing around $6.8 m in hospital costs alone.
The present health reforms in New Zealand do not appear to be working. Recent figures released by the Government show that official hospital waiting lists are growing, and that many people are adversely affected by this situation. Those New

Zealanders who are unable to afford private health insurance are having to wait for treatment, often with a consequent deterioration in their health and an associated financial and social burden. Of course the paradox is, as Grant *et al.* (1997) argue, if access to care is improved to deprived sections of the community there will be increasing pressure on the health system to contain costs. It seems ironic of society, when New Zealand's richest person made his fortune in alcohol and tobacco manufacturing, and the lowest echelon of our society suffer from adverse health, caused in part by alcohol and tobacco consumption.

7.3 Suggestions for further research

Several key limitations exist in this study which would benefit from evaluation in future research. For a more accurate assignment of meshblock ID's an updated geocoding methodology would be advisable. Until the various suppliers of admission data to the NZHIS (and the NZHIS themselves) follow set guidelines on data entry, it will be a irksome process to correctly geocode admissions data.

It would be very interesting to look at the contextual effects of place on hospital admissions. Some research has been completed by Barnett (1999) on the contextual effects of smoking. Using advanced spatial analysis techniques a index would be able to be developed and applied to hospital admissions.

We have used an admissions database based on admission into Christchurch Hospital. It would make an interesting comparison to examine admissions by residents of Christchurch to any hospital. We would expect to see some different patterns, especially with elective surgery to the smaller rural hospitals.

References

Aday, L. Anderson, R. 1974 *A framework for the study of access to medical care* Health Services Research 9 p. 208 - 220

Albert, D. Gesler, W. Wittie, P. 1995 *Geographic Information Systems and Health: an educational resource* Journal of Geography 94 p. 350 - 356

Altman, D. 1991 Practical Statistics for Medical Research Chapman and Hall: London

Anderson, R. 1968 *A behavioral model of families use of health services* Centre for Health Administration Studies 25 University of Chicago: Chicago

Andrews, A. Jewson, N. 1993 *Ethnicity and Infant Deaths: The Implications of Recent Statistical Evidence for Materialist Explanations* Sociology of Health and Illness 15 (2) p. 137 - 156.

Arber, S. 1989 *Gender and Class Inequalities in Health: Understanding the Differentials* in Health Inequalities in European Countries eds Fox, J. Aldershot: Brookfield

Arber, S. 1991 *Class, Paid Employment and Family Roles: Making Sense of Structural Disadvantage, Gender and Health Status* Social Science and Medicine 32 (4) p. 425 - 436

Ashton, T. 1999 The Health Reforms: To Market and Back? in *Redesigning the Welfare State in New Zealand: Problems, Polices, Prospects* eds Boston, J. Dalziel, P. St John, S. Oxford University Press: Oxford

Barnett, P and Barnett, R. 1997 *A turning tide? Reflections on ideology and health service restructuring in New Zealand* Health and Place (3) 1 p. 55 – 58

Barnett, R and Barnett, P. 1989 *Restructuring the welfare state; the growth and impact of private hospitals in New Zealand* in Scarpi, J. ed Health Services Privatiation in Industrial Societies Rutgers University Press: New Brunswick

Barnett, R and Coyle, P 1998 *Social inequality and general practitioner utilisation: assessing the effects of financial barriers on the use of care by low income groups* New Zealand Medical Journal ?????

Barnett, R. 1991 *Where have all the Doctors gone? Changes in the geographic distribution of general practitioners in New Zealand since 1975* New Zealand Medical Journal 104 p.314-5

Barnett, R. 1991b *Where have all the Doctors gone? Intraurban trends: Changes in the geographic distribution of general practitioners in New Zealand since 1975* New Zealand Medical Journal 104 p.337-9

Barnett, R. 1999 Does place of resident matter? Contextual Effects and Smoking in Christchurch (forthcoming)

Barwick, H. Nuthall, J. 1992 The Impact of Economic and Social Factors on Health Public Health Association of New Zealand: Wellington

Benzeval, M. Judge, K. and Whitehead, M. 1993 *Introduction* in *Tackling Inequalities in Health – an agenda for action* eds Benzeval, Judge. Whitehead Kings Fund: London

Berthoud, R. 1976 The disadvantages of Inequality: A study of Social Deprivation MacDonald and Janes: London

Blank, R. 1997 The price of life: The future of American Health Care Columbia University Press: New York

Blaxter, M. 1990 Health and lifestyles Routledge; London

Borman, B. 1980 *Diabetes mellitus morbidity in New Zealand: a geographic perspective* Social Science and Medicine 14 p. 185 - 189

Borman, B. 1995 Standardising Rates of Disease Public Health Commission: Wellington

Boston, J. 1999 New Zealand's Welfare State in Transition in *Redesigning the Welfare State in New Zealand: Problems, Polices, Prospects* eds Boston, J. Dalziel, P. St John, S. Oxford University Press: Oxford

Brown, L. 1993 *Genetics and the environment: understanding geographical variations in the incidence of childhood diabetes* New Zealand Geographer 49 p. 32 - 39

Brown, L. and Barnett, R. 1992 *Influence of bed supply and health care organisation on regional and local patterns of diabetes related hospitalisation* Social Science and Medicine (35) 9 p. 1157 – 1170

Brown, M. Crampton, P. 1997 *New Zealand policy strategies concerning the funding of general practitioner care* Health Policy 41 p. 87 - 104

Brown, M. and Madge, N. 1982 Despite the Welfare State Heinemann Educational Books Ltd: London

Brown, M. Salmond, G. 1997 The impact of New Zealand's (partly) policy induced economic structural reforms on population health Health Services Research Centre: Wellington

Britton, S. Le Heron, R. and Pawson, E. eds 1993 Changing Places in New Zealand: A Geography of restructuring New Zealand Geographical Society: Christchurch

Bryson, L. 1992 Welfare and the State: Who benefits? Macmillian: Basingstoke

Bunkell, P. 1999 http://www.alliance.org.nz accessed 22/11/99

Canterbury Health 1998 Canterbury Health Limited Annual Report 1998 Canterbury Health: Christchurch

Carstairs, V. and Morris, R. 1989 *Deprivation: Explaining differences in mortality between Scotland, England and Wales* British Medical Journal 299 p. 886 - 889

Carstairs, V. and Morris, R. 1991 Deprivation and Health in Scotland Aberdeen University Press: Aberdeen

CCMAU 1996 Crown Health Enterprises: Briefing to the Incoming Minister Crown Company Monitoring Advisory Unit: Wellington

Charlton, R. Hartley, R. Silver, R. Holland, W. *Geographical variation in mortality form conditions amenable to medical intervention in England and Wales* Lancet p. 691 - 696

Clarkson, J and Lafferty, A. 1984 *Changing access to primary health care for children in Otago 1980 – 1983* New Zealand Family Physician 11 p. 172 – 5

Coyle, P 1996 General Practitioner Utilisation by lower socio-economic groups Unpublished Masters Thesis: University of Canterbury

Crampton, P. Salmond, C. and Sutton, F. 1997a NZDep91 Index of Deprivation Health Services Research Centre: Wellington

Crampton, P. Salmond, C. and Sutton, F. 1997b NZDep91 Index of Deprivation – Instruction Book Health Services Research Centre: Wellington

Crampton, P. Salmond, C. and Sutton, F. 1998 NZDep96 Index of Deprivation – Instruction Book Health Services Research Centre: Wellington

Curtis, S. and Jones, I. 1998 *Is there a place for geography in the analysis of health inequality* Sociology of Health and Illness 20 (5) p. 645 - 673

Curtis, S and Taket, A. 1996 Health and Societies: Changing perspectives Arnold: London

Dann, C. and Du Plessis, R 1992 After the cuts, Surviving on the domestic Purposes Benefit University of Canterbury: Christchurch

Davis, P. 1985 *Office encounters in general practice in the Hamilton Health district* New Zealand Medical Journal 98 p. 789 - 92

Davis, P. and Dew, K. 1999 Health and Society Aotearoa/New Zealand Oxford University Press: Melbourne

Davis, P. McLeod, K. Ransom, M. and Ongley, P. 1997 The New Zealand Socio-economic Index of Occupational Status Statistics New Zealand: Wellington

Department of Statistics 1984 National Health status measures, Report of the Health Status Working Group Department of Statistics: Wellington

Department of Statistics 1992 National Summary 1991 Census of Population and Dwellings Department of Statistics: Wellington

Dixon, F. Watt, J. Lewis, S. Crane, J. and Burgess, C. 1994 *The influence of increased health care costs on general practitioners consultations and prescription collection* New Zealand Medical Journal 107 p. 353 - 5

Duke-Williams, O. Openshaw, S. Rees, S. and Evans, A. 1998 A method for assessing risk of disclosure in census microdata and tabular data Centre for Computational Geography: Leeds

Durie, M. 1985 *A Maori Perspective of Health* Social Science and Medicine 20, 5, p.483-486.

Durie, M. 1994 Whairo – Maori Health Development Oxford University Press: Auckland

Dutton, D. Levine, S. 1989 *Socioeconomic Status and Health: Overview, Methodological Critique, and Reformulation* in Pathways to Health. The Role of Social Factors eds Bunker, J.et al, The Henry Kaiser Family Foundation: Menlo Park

Elley, W. Irving, J. 1972 *A Socio-Economic Index for New Zealand: A Rejoinder to I. R.Brooks and P. F. Cuttance* New Zealand Journal of Educational Studies 9 (1) May p. 85 - 87.

Elley, W. Irving, J. 1974 *A Socio-Economic Index for New Zealand based on levels of education and income form the 1966 census* New Zealand Journal of Economic Studies 7 p. 153 - 167.

Environmental Policy and Planning Unit. 1998 Christchurch City Update '97 Christchurch City Council: Christchurch

Exeter, D. 1998 An evaluation of Cartographic Visualisation Techniques for Epidemiology Unpublished Masters Thesis: University of Auckland

Foster, E. 1996 Health effects of suspended particulate Canterbury Regional Council: Christchurch

Fox, J. and Beneval, M. 199? Perspectives on social variations in *Tackling Inequalities in Health – an agenda for action* eds Benzeval, Judge. Whitehead Kings Fund: London

Ganzeboom ,H. Treiman, D. 1996 *Internationally Comparable Measures of Occupational Status for the 1988 ISCO* Social Science Research 25 p. 201 - 239.

Grant, C. Forrest, C. and Starfield, B. 1997 *Primary care and health reform in New Zealand* New Zealand Medical Journal 110 p. 35 - 39

Glyn, A and Miliband, D. Eds 1994 Paying for Inequality: The economic Cost of Social Injustice Rivers Oram Press: London

Easton, B. 1986 Wages and the Poor Allen and Unwin (New Zealand) Ltd: Wellington

Elliot, M. Skinner, C and Dale, A. 1998 Special uniques, random uniques and sticky populations: Some counterintuitive effects of geographical detail on disclosure risks Proceedings of the Conference on Statistical Data Protection, Lisbon

Feldman, J. 1966 The Dissemination of Health Information Aldine: Chicago

Ford, G. Ecob, R. Hunt, K. Macintyre, S. West, P. 1994 *Patterns of Class Inequality in Health through the Lifespan: Class Gradients at 15, 35, and 55 Years in the West of Scotland* Social Science and Medicine 39 (8) p. 1037 - 1050

Gatrell, A. Bailey, C. 1996 *Interactive spatial data analysis in medical geography* Social Science and Medicine 42 p. 843 - 855

George, V. and Howards, I. 1991 Poverty Admist Affluence: Britain and the Untied States Edward Elgar Publishing Ltd: Worcestor

Greenland, S. Morgenstern, H. 1989 *Ecological bias, confounding, and effect modification* International Journal of Epidemiology 18 p. 269 - 274

Gross, P. 1972 *Urban health disorders, spatial analysis and the economics of health facility location* International Journal of Health Services 2 p. 63 – 84

Hassall, I. 1996 The Multiple Affects of Poverty on Children and Young People Massey University: Albany

Hay, D. 1988 *Socioeconomic Status and Health Status: a Study of Males in the Canada Health Survey* Social Science and Medicine 27 (12) p. 1317 - 1332

Health Funding Authority 1998 The Health of People in the South Health Funding Authority: Dunedin

Hirschman, A. 1991The rhetoric of reaction : perversity, futility, jeopardy Belknap Press:Cambridge

Hoskins, R. 1990 Neighbourhood of domicile and hospital admissions in Auckland: is there a relationship *New Zealand Medical Journal* 103 (903) p.584

House, J. 1997 Social Inequality harms health, Sociologist says http://www1.od.nih.gov/obssr/socialin.htm (accessed 5/5/99)

House, J. Kessler, R. Herzog, A. *et al.* 1990 *Age, Socioeconomic Status, and Health* The Milbank Quarterly 68 (3), p. 383 - 411

Howden-Chapman, P. Cram, F. 1998 Social, Economic and Cultural Determinants of Health National Health Committee: Wellington

Hurowitz, J. 1993 Towards a Social Policy for Health *New England Journal of Medicine* 329 (2) p. 130-33

Jackson, G. 1988 *Asthma mortality by neighborhood of domicile* New Zealand Medical Journal 101 p. 593 - 595

Jackson, G. 1999 Deprivation in South Auckland Middlemore Hospital: Auckland

Jackson, G. Kelsall, L. Parr, A. and Papa, D. 1998 Socio-economic Inequalities in Health Care North Health: Auckland

Jamieson, K. 1998 Poverty and Hardship in Christchurch Christchurch City Council: Christchurch

Joseph, A. 1986 *The Accessibility of Public Health Services in Auckland: A Geographic Study* New Zealand Geographer 42 (1) p. 11 – 17.

Joseph, A. and Phillips, D. 1984 Accessibility and Utilization: Geographical Perspectives on Health Care Delivery Harper & Row: London

Kaplan, H. 1989 Health, Disease and the Social Structure in Handbook of Medical Sociology (4th edition) eds Freeman, H. and Levine, S. Prentice Hall: New Jersey.

Kawachi, I. Marshall, S. and Pearce, N 1991 *Social class inequalities in the decline of coronary heart disease among New Zealand men, 1975 – 1977 to 1985 – 1987* International Journal of Epidemiology 20 (2) p. 393 –98

Kearns, R. 1991 *The place of health in the health of the place: the case of the Hokianga special medical area* Social Science and Medicine 33 (4) p. 519 - 530

Kearns, R. Smith, C. and Abbott, M. 1993 *Another day in paradise? Life on the margins in urban New Zealand* Social Science and Medicine 33 (4) p. 369 -79

Kelsey, J. 1995 The New Zealand Experiment: A World Model for Structural Adjustment? Auckland University Press: Auckland

Kirkpatrick, R, 1997 Historical Atlas of New Zealand Batemans: Wellington

Kirkpatrick, R. 1999 Contemporary Atlas of New Zealand Batemans: Wellington

Knox, P. 1982 Urban Social Geography: An introduction Oxford University Press: London

Kokaua, J. 1993 Computation and Validation of Midland Health's Index of Relative Disadvantage Midland Health: Hamilton

Kokaua, J. 1997 Deprivation scores using 1991 census data Southern Regional Health Authority: Dunedin

Krieger, N. Fee, E. 1994 *Social Class: the Missing Link in US Health Data* International Journal of Health Services 24 (1) p. 25 - 44

Langford, I. And Bentham, G 1996 *Regional variations in mortality rates in England and Wales: an analysis using multi-level modelling* Social Science and Medicine 42 p.897 - 908

Le Heron, R. and Pawson, E. eds 1996 Changing Places: New Zealand in the 1990's Longman Paul: Auckland

Leyland, A. 1996 Modelling complex Hierarchical Structures – Hospital admission rates in Scotland http://www.medent.umontreal.ca/multilevel/leyprop.html accessed 18th April 1999

Lilieufeld, D. and Stolley, P. 1994 Foundation of Epidemiology 3rd Edition Oxford University Press: London

LINZ 1999 http://www.linz.govt.nz/services/topomapping/50kdata.html

Logan et al 1989 *Is there a case for government intervention?* in Healthy Competition Center for Independent Studies: Sydney

Lundberg, O. 1986 *Class and Health: Comparing Britain and Sweden* Social Science and Medicine 23 (5) p. 511 - 517.

Macran, S. Clarke, L. Sloggett, A. Bethune, A. 1994 *Women's Socioeconomic Status and Self-Assessed Health: Identifying Some Disadvantaged Groups* Sociology of Health and Illness 16 (2) p. 182 - 208

Malcom, L. 1987 *Availability and utilisation of mental illness and mental handicap beds in New Zealand* New Zealand Medical Journal July 1987

Mason, J. 1999 Standardisation Statistics New Zealand: Wellington

Macintyre, S. 1986 *The Patterning of Health by Social Position in Contemporary Britain: Directions for Sociological Research* Social Science and Medicine 23 (4), p. 393 - 415.

Macintyre, S. Maciver, S. Sooman, A. 1993 *Area, Class and Health: Should we be Focusing on Places or People?* Journal of Social Policy 22 (2) p. 213 - 234.

McKinlay, J. 1972 *Some approaches and problems in the study of the use of services – an overview* Journal of Health and Social Behavior 13 p. 115 - 152

Manitoba Department of Health 1992 Health Status indicators in Manitoba Manitoba Department of Health: Regina

Marmot, M. Kogevinas, M. Elston, M. 1987 *Social/ Economic Status and Disease* American Review of Public Health 8, p. 111 - 135

Marshall, S. Kawachi, I. Pearce, N. et al 1993 *Social class differences in mortality from diseases amenable to medical intervention in New Zealand* International Journal of Epidemiology 22 p. 226 - 261

Ministry of Health 1995 Patients in Profile Ministry of Health: Wellington

Ministry of Health 1998a Hospital throughput 1996/97 Ministry of Health: Wellington

Ministry of Health 1998b Purchasing for Your Health 1996/97 Ministry of Health: Wellington

Ministry of Health 1999 Taking the pulse: the 1996/97 New Zealand Health Survey Ministry of Health: Wellington

Mishler, E. 1981 Social contexts of health, illness and patient care Cambridge University Press: Cambridge

Mitchell, E. Borman, B. 1989 *Maori and non-Maori postneonatal mortality rates by domicile* New Zealand Medical Journal 102 p. 631

Moon, G. 1995 *(Re)placing research on health and health care* Health and Place 1 p. 1 - 4

Morris, R. Carstairs, V. 1991 *Which deprivation? A comparison of selected deprivation indices* Journal of Public Health Medicine 13 p. 318 - 326

Murray, C. 1984 Losing ground: American Social policy 1950-1980 Basic Books: New York

Mustard, J. 1996 Health and social capital in *Health and Social Organization. Towards a Health Policy* for the 21st Century eds Blane, D. Brunner, E. Wilkinson, R. Routledge: London

National Health Committee 1998 The Social, Cultural and Economic Determinants of Health in New Zealand: Action to Improve Health National Advisory Committee on Health and Disability: Wellington

Najman, J. 1988 *The Measurement of Socioeconomic Inequality and Social Class in Australia: A Review of Past Practices and Recent Developments* Community Health Studies 12 (1) p. 31 - 41

Okun, A. 1975 Equality and Efficiency: The big Trade-Off Brookings Institution: Washington DC

Pappas, G. Queen, S. Hadden, W. and Fisher, G. 1993 The increasing Disparity in Mortality Rates between Socio-Economic Groups in the United States, 1960 and 1986 *New England Journal of Medicine* 329 (2) p. 203-9

Paul, C. 1993 *Inequalities in health and redefining values* New Zealand Medical Journal 106 p. 121 - 122.

Pearce, N. Davis, P. Smith, A. et al 1983 *Mortality and social class in New Zealand 1: overall male mortality* New Zealand Medical Journal 96 p. 281 - 285

Pearce, N. Marshall, S. Borman, B. 1991 *Undiminished social class mortality differences in New Zealand men* New Zealand Medical Journal 104 p 153 - 6

Pearce, N. Pomare, E. Marshall, S. Borman, B. 1993 *Mortality and social class in Maori and non-Maori New Zealand men: changes between 1975-7 and 1985-7* New Zealand Medical Journal 106 p. 193 - 196

Pickle, L. White, A. 1995 *Effects of the choice of age-adjustment method on maps of death rates* Statistical Medicine 14 p. 615 - 627

Poikolainen, K. and Eskola, J. 1986 *The effect of health services on mortality: decline in death rates from amenable and non-amenable causes in Finland, 1969 – 1981* Lancet p. 691 - 696

Pomare, E. Keefe-Ormsby, V. Ormsby, C. et al 1995 Hauora: Maori Standards of Health. A study of the years 1970-1991 Te Ropu Rangahau Hauora a Eru Pomare: Wellington

Pyle, G. and Lauer, B. 1975 *Comparing spatial configurations: Hospital service area and disease rates* Economic Geography 33 p. 50 - 68

Ringen, S. 1998 *Direct and Indirect Measures of Poverty* Journal of Social Policy 17 (3) p. 351 - 365

Robson, B. Burgess, C. Pearce, N. et al 1993 *Prevalence of asthma symptoms among adolescents in the Wellington region by area and ethnicity* New Zealand Medical Journal 106 p. 239 - 241

Roemer, M. 1961 *Bed supply and hospital utilisation: a natural experiment* Journal of the American Medical Association 35 p. 37 - 42

Rosentock, I. 1960 *What research in motivation suggests for public health* American Journal of Public Health 50 p. 295 – 302

Rosentock, I 1966 *Why people use health services* Health Services Research 44 p. 94 – 127

Rutstein, D. Berenberg, W. Chalmers, T. Child, C. Fishman, A. Perrin E. 1976 *Measuring the quality of medical care* New England Journal of Medicine 294 p. 1146 - 1150

Salmond, C. Reinken, J. de Lacy, A. 1980 Community Attitudes to Sickness and Health: Stimulus and Response Vol 2. Department of Health Special Report Series 56 Government Printer: Wellington

Sang, B. 1997 Poverty in Christchurch Unpublished Masters thesis, University of Canterbury: Christchurch

Saunders, P. 1996 Poverty, Income Distribution and Health: An Australian Study Social Policy Research Centre Reports and Proceedings no. 128, University of New South Wales.

Sauders, D. Coulter, A. McPherson, K. 1989 Variations in Hopsital Admission rates: A review of the literature Kings Edward's Hospital Fund for London: London

Scott, A. Shiell, A. and King, M. 1996 *Is General Practitioner Decision-Making Associated with Patient Socio-Economic Status?* Social Science and Medicine 42 (1) p. 35-46.

Schwartz, S. 1994 *The fallacy of the ecological fallacy: the potential misuse of a concept and the consequences* American Journal of Public Health 84 p. 819 - 824

Sears, M. Rea, H. Beaglehole, R et al 1985 *Asthma mortality in New Zealand: a two year national study* New Zealand Medical Journal 107 p. 271 - 275

Sheerin, I. and Malcolm, L. 1978 The Parklands/Queenspark Health Survey: An exercise in community participation Health Planning and Research Unit: Christchurch

Shirley, K. 1999 http://www.act.org.nz accessed 22/11/99

Simmons, D. Gatland, B. Fleming, C. et al 1994 *Prevalance of known diabetes in a multi-ethnic community* New Zealand Medical Journal 107 p. 219 - 222

Smith, A. and Pearce, N. 1984 *Determinants of differences in mortality between New Zealand Maori and Non-Maori aged 15-64* New Zealand Medical Journal 97 p. 101 - 108

Statistics New Zealand. 1993 A picture of health Statistics New Zealand/Ministry of Health: Wellington

Statistics New Zealand 1999 New Zealand Offical Yearbook 1998 GP Publications : 1999

Stephens, R. 1994 The Incidence of Severity of Poverty in New Zealand : 1990 – 1991 Victoria University: Wellington

Stephens, R. Waldgrave, C. and Frater, P. 1995 *Measuring Poverty in New Zealand* Social Policy Journal of New Zealand 5 p. 88 - 112

Suchman, E. 1964 *Sociomedical variations among ethnic groups* American Journal of Sociology 70 p. 319 – 331

Suchman, E 1966 *Health orientation and medical care* American Journal of Public Health 56 p. 97 - 105

Sundquist, J. 1995 *Ethnicity, Social Class and Health. A Population-Based Study on the Influence of Social Factors on Self-Reported Illness in 223 Latin American Refugees, 333 Finnish and 126 South European Labour Migrants, and 841 Swedish Controls* Social Science and Medicine 40 (6) p. 777 - 787

Suser, N. 1994 *The logic of ecological: The logic of analysis* American Journal of Public Health 84 p. 825 - 829

Te Puni Kokiri 1993 He Kakano – a handbook of Maori health data Te Puni Kokiri: Wellington

Townsend , P. 1987 Deprivation *Journal of Social Policy* 16 (2) p. 125-140

Townsend, P. and Davidson, P. 1992 The Black Report in *Inequalities in Health* ed Townsend, P. Davidson,N. and Whitehead, M. Penguin: Harmondsworth.

Troughton, N. 1993 Roemer's law and Supplier Induced Demand Unpublished seminar paper: University of Canterbury

Tufte, E. 1983 The Visual display of Quantitative Information Graphics Press: Cheshire

Upton, S. 1991 Your health and the public health. A statement of government health policy Ministry of Health: Wellington

Veeder, N. 1975 *Health services utilization models for human services planning* Journal of the American Institute of Planners 41 p. 101 – 109

Walter, S. and Birnie, S. 1991 *Mapping mortality and morbidity patterns: an international comparison* International Journal of Epidemiology 20 p. 678 - 689

Westerling, R. *Trends in 'avoidable 'mortality in Sweden, 1974-85* Journal of Epidemiology and Community Health 46 p. 486 - 489

Whitehead, M. 1992 The Health Divide in *Inequalities in Health* ed Townsend, P. Davidson,N. and Whitehead, M. Penquin: Harmondsworth.

Williams, D. 1990 *Socioeconomic Differentials in Health: A Review and a Redirection* Social Psychology Quarterly 53 (2) p. 81 – 89

Wilson, N. Clements, M. Bathgate, M. Parkinson, S. 1996 Using Spatial Analysis to Improve and protect Public Health in New Zealand Ministry of Health: Wellington

Woodward, A and Kawachi, I. 1998 Why should we reduce health inequalities? National Health Committee: Wellington

Appendices

Appendix One

NHI number

The unique identification number assigned to a healthcare user by the National Health Index (NHI) system. Stored on the NMDS in an encrypted form. System-generated: 3 alphabetic characters plus 4 numerics, the last of which is a check digit.

Ethnicity Code

Statistics New Zealand official definition (from Smith 1981[3]), as modified by the National Data Policy Group:

A social group whose members have one or more of the following four characteristics:
(a) they share a sense of common origins;
(b) they claim a common and distinctive history and destiny;
(c) they possess one or more dimensions of collective cultural individuality;
(d) they feel a sense of unique collective solidarity.

Ethnic group should be self-identified wherever possible.
The code used is Statistics New Zealand Standard Classification of Ethnicity, level 2.
From 1 July 1996 up to three ethnic group codes can be collected for each healthcare user and each event.

Domicile code

Statistics New Zealand Area unit code representing a healthcare user's usual residential address. Also used for health agency facility addresses. The code used

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[3] Smith, Anthony. The Ethnic Revival. Cambridge University Press, 1981

from 1 July 1998 is the four-digit 1996 Health Census Area Unit Code especially created by Statistics New Zealand from their 1996 six-digit Census Area Unit Code.

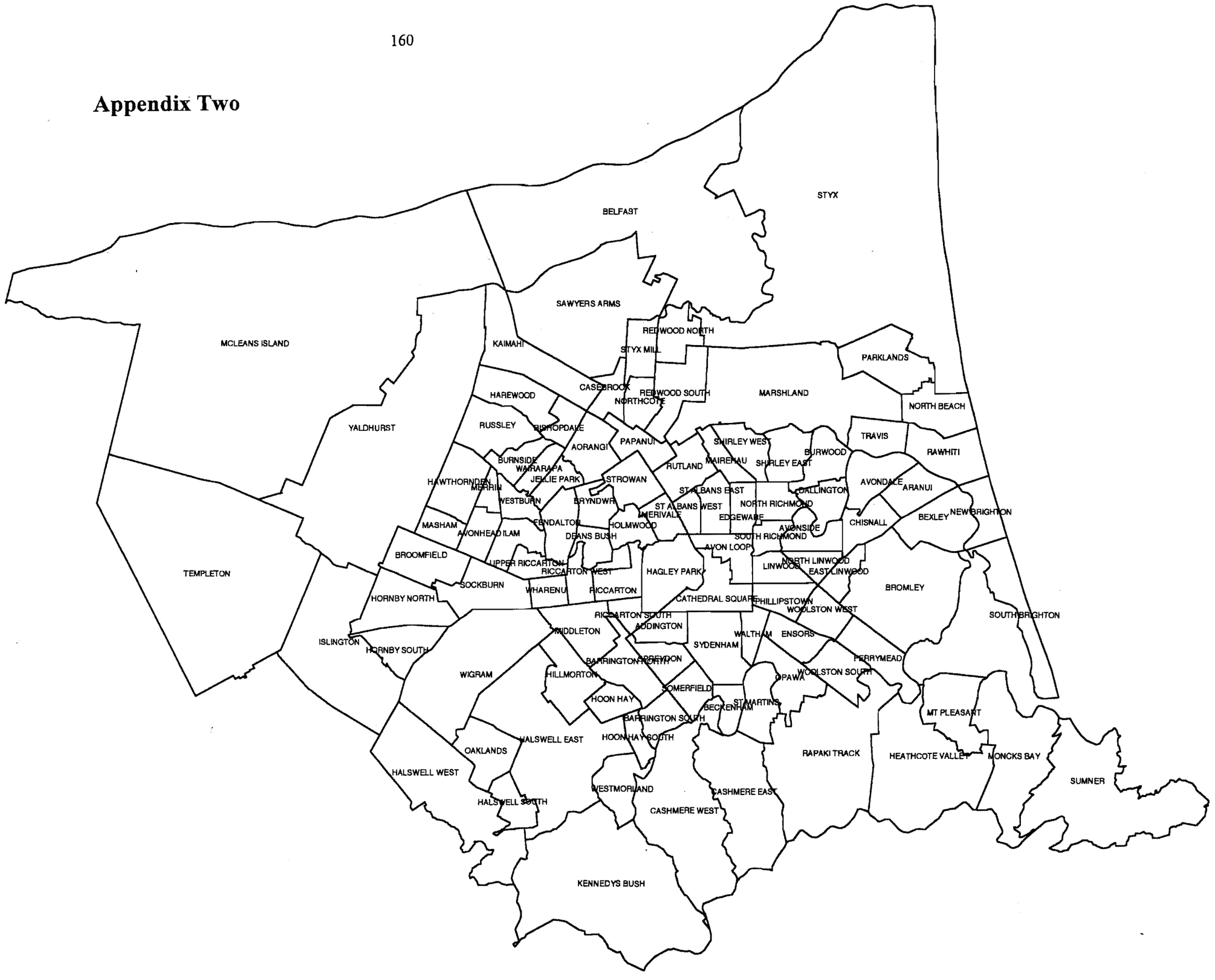
Admission Type

A code used to describe the type of admission for a hospital healthcare health event.

Code	Type of admission
AA	Arranged admission
AC	Acute admission
AP	Elective admission to Private Hospital
RL	Psychiatric patient
WN	Waiting list
WU	Code not used from 20/8/93
ZA	Arranged admission - ACC
ZC	Acute admission - ACC
ZP	Private - ACC
ZW	Waiting list - ACC

Source: NZHIS MDS

Appendix Two



Appendix Three

Age-standardised rates for admissions by all patients

Total	All admissions
ASH	Ambulatory sensitive admissions
AVOID	Avoidable admissions
Acute	All acute admissions

Census Area Unit			1996				1991			
	NZDep96 Decile	HEQ	Total	ASH	AVOID	Acute	Total	ASH	Avoid	Acute
Addington	9	1.7	91	23	12	69	73	10	6	49
Aorangi	4	-0.4	96	16	9	67	46	7	5	31
Aranui	10	1.6	244	54	26	182	69	12	7	48
Avon Loop	9	2.2	106	25	13	83	70	9	5	54
Avondale	2	0.0	89	25	11	62	43	2	2	25
Avonhead	8	-1.2	76	15	11	57	26	1	1	16
Avonside	6	0.8	60	14	7	46	63	11	7	47
Barrington North	4	0.3	292	59	34	201	58	10	5	39
Barrington South	3	-0.4	115	23	17	92	51	5	3	37
Beckenham	5	-0.5	82	21	10	65	47	7	4	34
Belfast	8	-0.3	95	23	9	71	67	8	3	50
Bexley	4	0.6	129	31	12	92	78	12	8	50
Bishopdale	8	-0.5	114	23	13	81	66	7	6	44
Bromley	7	0.9	132	25	11	89	64	13	7	44
Broomfield	1	0.4	48	7	5	33	55	7	3	36
Bryndwr	3	-1.2	70	16	11	58	34	4	3	23
Burnside	5	-1.0	97	18	10	71	43	6	5	29
Burwood	8	-0.6	89	13	8	52	56	6	2	35
Casebrook	1	0.5	87	20	8	59	54	8	5	39
Cashmere East	1	0.0	70	10	7	47	34	4	2	24
Cashmere West	8	0.0	69	14	8	52	38	5	4	28
Cathedral Square	7	1.4	22	4	2	17	111	17	19	72
Chisnall	5	0.3	125	30	17	99	69	11	8	50
Dallington	1	-0.3	92	20	11	69	52	6	4	28
Deans Bush	8	0.0	36	5	3	27	41	3	2	31
East Linwood	7	0.8	126	31	19	88	59	6	5	44
Edgeware	8	0.9	63	12	5	47	55	8	4	40
Ensors	3	1.0	107	23	13	78	60	6	2	37
Fendalton	8	-1.0	245	32	16	169	40	5	4	26

Ferrymead	7	0.8	138	33	17	104	86	14	9	57
Hagley Park	4	0.8	72	11	6	48	49	6	6	38
Halswell East	1	-0.9	134	17	13	96	103	14	7	69
Halswell South	3	-1.2	24	1	1	18	29	2	5	20
Halswell West	5	-1.5	120	28	19	79	63	8	5	51
Harewood	2	-0.5	77	12	8	53	39	5	3	26
Hawthornden	4	-1.4	27	6	4	22	67	9	6	50
Heathcote Valley	7	-0.2	23	6	4	18	52	7	1	38
Hillmorton	1	0.0	108	25	12	75	61	9	5	37
Holmwood	4	0.0	50	7	4	40	38	9	8	29
Hoon Hay	2	-0.7	164	33	14	111	43	5	2	31
Hoon Hay South	7	-0.9	110	19	8	70	49	6	2	32
Hornby North	7	0.2	112	20	12	84	61	6	5	43
Hornby South	4	0.0	81	20	12	61	43	4	2	27
Ilam	5	-0.7	65	15	8	49	33	4	1	23
Islington	9	-0.1	92	23	11	67	57	11	5	35
Jellie Park	3	1.0	104	21	8	73	54	11	5	39
Kaimahi	1	0.0	79	15	8	58	50	7	4	32
Kennedys Bush	9	0.0	3	0	0	2	22	3	3	15
Linwood	6	1.8	122	27	16	90	69	9	7	48
Mairehau	3	-0.2	80	15	8	59	54	7	5	31
Marshland	3	-0.7	73	15	8	53	69	12	11	47
Masham	2	-1.1	74	12	4	52	38	4	1	26
Mcleans Island	4	-1.2	41	4	0	36	9	0	0	9
Merivale	2	-0.3	69	15	7	52	40	5	2	31
Merrin	8	-1.2	72	11	6	49	27	5	3	16
Middleton	2	1.0	47	4	1	38	48	1	0	38
Moncks Bay	1	-1.0	308	49	30	216	0	0	0	0
Mt Pleasant	8	0.0	69	11	6	51	41	5	3	29
New Brighton	7	0.8	136	23	10	100	65	9	6	47
North Beach	8	0.3	296	80	44	210	54	9	6	36
North Linwood	5	1.0	73	13	6	51	47	5	2	35
North Richmond	7	0.0	113	22	12	87	62	9	4	43
Northcote	3	0.0	99	18	12	65	64	7	4	46
Oaklands	5	-1.1	136	30	17	100	46	5	2	32
Opawa	4	-0.4	98	20	9	75	66	8	6	47
Papanui	5	-0.2	117	21	11	85	59	5	4	43
Parklands	9	-0.1	67	11	5	49	69	5	2	42
Phillipstown	2	2.0	151	31	16	100	79	13	8	49
Rapaki Track	7	-0.6	26	6	2	18	49	9	7	30
Rawhiti	3	0.5	89	16	6	61	63	9	5	44
Redwood North	4	-0.6	80	16	8	59	54	5	4	35
Redwood South	7	-0.6	63	13	9	49	67	12	5	47
Riccarton	9	0.8	92	17	7	64	77	18	7	54

Riccarton South	7	1.6	125	23	12	94	91	7	4	57
Riccarton West	3	0.4	64	11	7	49	53	8	5	36
Russley	3	-1.2	68	11	6	48	36	4	4	25
Rutland	3	-0.7	81	15	9	66	46	4	3	30
Sawyers Arms	7	-1.0	78	13	8	61	40	5	3	30
Shirley East	8	0.0	113	25	13	81	56	6	4	36
Shirley West	6	0.5	106	24	13	77	58	10	6	39
Sockburn	5	0.0	166	33	18	121	51	9	5	36
Somerfield	5	0.0	84	16	12	61	51	6	4	37
South Brighton	9	-0.5	97	21	5	67	50	4	2	32
South Richmond	7	1.6	118	29	15	92	77	8	3	57
Spreydon	7	0.8	102	25	13	78	63	10	6	43
St Albans East	6	0.8	102	21	12	81	53	8	4	37
St Albans West	3	0.2	86	17	8	56	46	5	2	33
St Martins	3	-0.6	76	15	10	57	53	8	5	36
Strowan	5	-0.8	63	11	5	51	32	4	3	21
Styx	6	-0.1	69	14	8	51	62	5	3	42
Styx Mill	3	0.1	83	18	9	59	69	12	6	53
Sumner	8	-0.5	107	25	14	76	44	6	3	29
Sydenham	7	1.3	113	24	11	85	62	8	4	45
Templeton	4	0.1	1	0	0	1	2252	102	76	1759
Travis	6	-0.5	46	6	2	31	71	4	1	40
Upper Riccarton	5	0.1	75	15	8	53	47	2	2	34
Wairarapa	9	-0.7	42	8	3	29	45	5	2	27
Waltham	2	1.7	96	11	7	81	75	3	4	50
Westburn	1	-1.2	61	9	7	49	33	5	3	20
Westmorland	7	0.0	73	19	6	62	38	6	4	32
Wharenui	6	0.3	108	17	7	77	58	8	4	43
Wigram	8	-0.6	45	7	5	31	42	5	3	29
Woolston South	8	1.0	110	25	19	81	68	8	5	45
Woolston West	4	0.7	131	28	13	95	52	5	3	35

Source: NZHIS MDS

Appendix Four

Composition of Census Area Unit populations by deprivation (usually resident)

CAUNAME	NZ Dep96 deciles										
	1	2	3	4	5	6	7	8	9	10	Total
Addington							133	1185	1131	320	2769
Aorangi	111	702	1234	1318	524	303	452	281	192		5117
Aranui							396	784	565	2931	4676
Avon Loop					103	815	534	716	1268	740	4176
Avondale	896	708	662	1439		538	192				4435
Avonhead	737	1312	573	341	511						3474
Avonside				509	211	769		432	649	600	3170
Barrington North		217	620	276	773	1611	543	522	479		5041
Barrington South	226	123	228	1429	437	230	170				2843
Beckenham	131	766	765	716							2378
Belfast		1061	442	160	159	1161	230	350			3563
Bexley					380	333	609	734	1182	428	3666
Bishopdale		513	330	1219	144	116	144		67		2533
Bromley					224	453	636	651	891	162	3017
Broomfield	177	355	335		142	236	506	203	176	338	2468
Bryndwr	1257	938	437	163							2795
Burnside	285	648	491	332	257	174	104				2291
Burwood	413	275	389	483	275	319	472	270			2896
Casebrook	142			425	305		138	161	690	604	2465
Cashmere East	2343	481	189								3013
Cashmere West	2415	332		159	114	92					3112
Cathedral Square					196	62	105	273	196		832
Chisnall				268		1191	676	505		155	2795
Dallington		681	293	535	794	274	307	105	411		3400
Deans Bush	1105	316		188							1609
East Linwood							555	564	552	223	1894
Edgeware		104	194	109	234	610	498	1186	456		3391
Ensors						571	812	399	999	612	3393
Fendalton	282	891	720	285	295	157		73			2703
Ferrymead						277	495	282	830		1884
Hagley Park			228	143		152	187	570	308		1588
Halswell East	193		375		256	116					940
Halswell South	861	511	67								1439
Halswell West		93	222								315
Harewood	294	516	704	279	387			194	377		2751

Hawthornden	1431	1521					214				3166
Heathcote Valley		524		249	584				137		1494
Hillmorton	119	492	514	387	738	514	361		665	886	4676
Holmwood	1638	387	140		184						2349
Hoon Hay	155	345	661	1163	430	139					2893
Hoon Hay South		1037	573	253							1863
Hornby North				140	717	1169	127	140	461	133	2887
Hornby South		91	153	681	757	458	1369	805	386	188	4888
Ilam	423	836	849	668	252	411	678				4117
Islington			280	252	585	489	516				2122
Jellie Park	125		170			302			460	1199	2256
Kaimahi	826	670	1334	749	201	283	339	191			4593
Kennedys Bush	344										344
Linwood						220	455	494	1581	1519	4269
Mairehau	93	107	250	732	156	374	893	182			2787
Marshland	971	1146	882	433	306	638					4376
Masham	701	790	376	778	360						3005
Mcleans Island	19		227								246
Merivale		568	812	721	823	194					3118
Merrin	603	161	470		308						1542
Middleton						212		317	107	179	815
Moncks Bay	1790	465	384	426	126	120					3311
Mt Pleasant	3174	620									3794
New Brighton					93	480	363	1076	261		2273
North Beach		152	307	559		660	1621	632	499		4430
North Linwood							496	1012	916		2424
North Richmond	243	133	804	486	281	300		327	285		2859
Northcote			411	344	566	160		486	170	183	2320
Oaklands	2100	446	605	960	1265						5376
Opawa	505	447	483	481	319	154	261	583	140		3373
Papanui	642	811	357	679	28	287		202	325		3331
Parklands	428	1489	521	1248	17	788	255	689	322		5757
Phillipstown							428	556	1644	785	3413
Rapaki Track	523	168	362	439							1492
Rawhiti		120	165		872	777	524	631	463		3552
Redwood North	167	915	1157	396	307	492		126			3560
Redwood South		1091	396	120	816	237			197		2857
Riccarton			154	91	479	686	876	805	264		3355
Riccarton South				0				189	181		370
Riccarton West			781	327	310	1189		272	880	127	3886
Russley	661	709	768	403	120	130					2791
Rutland	1444	866	898	774	604	285	148				5019
Sawyers Arms	452	1074	614	231				262			2633
Shirley East		280	248	554	488	343	177	256	300	796	3442

Shirley West	204	270	335	168	890		301		407	1102	3677
Sockburn		448	569	821	1077	563	434		821	479	5212
Somerfield		477	295	657	601	1184	149	96			3459
South Brighton	420		1298	576	315	428	392	366			3795
South Richmond						134		466	1190	583	2373
Spreydon				202	605	899	766	232	509	133	3346
St Albans East			189	393	606	1012	793	655	793	104	4545
St Albans West		134		500	561	739	486	230			2650
St Martins	1512	576	540	369	691			581			4269
Strowan	1749	1210	370		136		221	308	140		4134
Styx	95		782	393	327	110	355	186	185		2433
Styx Mill	342	452	191	491				351	149	329	2305
Sumner	426	597	813	941	630	305					3712
Sydenham						274	1050	1790	1702	379	5195
Templeton					40		16				56
Travis	500	621	124	133	321	302		192	170		2363
Upper Riccarton		218	265	317	511	201	282	349	374		2517
Wairarapa	243	294		410	292	122	127		281		1769
Waltham								132	563	230	925
Westburn	939	486	427	702		155					2709
Westmorland	1184										1184
Wharenui				171	824	160	530	166		385	2236
Wigram			111	176	124	412	245	122	156		1346
Woolston South			103		227	267	110	642	694	227	2270
Woolston West						294	750	1697	253	146	3140
Yaldhurst		565						47	47		659

Source : Statistics New Zealand/SuperMap

Appendix Five

Avoidable hospitalisations

ICD-9-CM range		Condition description	AVOID category
032	03299	Diptheria	Immunizable disease
033	03399	Whooping cough	Immunizable disease
037	03799	Tetanus	Immunizable disease
045	04599	Polio	Immunizable disease
055	05599	Measles	Immunizable disease
072	07299	Mumps	Immunizable disease
2501	25039	Ketoacidosis	Diabetes
2510	25109	Hypoglycaemic coma	Diabetes
2512	25129	Hypoglycaemic unspecified	Diabetes
2768	27689	Hypokalemia	Hypokalemia
4010	40109	Malignant hypertension	Malignant hypertension
4020	40209	Malignant hypertensive heart disease	Malignant hypertension
40211	40211	Congestive heart failure	Congestive heart failure
40291	40291	Congestive heart failure	Congestive heart failure
4030	40309	Malignant hypertensive renal disease	Malignant hypertension
4040	40409	Malignant hypertensive renal/heart	Malignant hypertension
4050	40509	Secondary malignant hypertension	Malignant hypertension
428	42899	Congestive heart failure	Congestive heart failure
4372	43729	Hypertensive encephalopathy	Malignant hypertension
481	48399	Bacterial pneumonia	Pneumonia
485	48699	Pneumonia	Pneumonia
493	49399	Asthma	Asthma
5310	53129	Acute gastric ulcer	Perforated or bleeding ulcer
5314	53169	Chronic gastric ulcer	Perforated or bleeding ulcer
5320	53229	Acute duodenal ulcer	Perforated or bleeding ulcer
5324	53269	Chronic duodenal ulcer	Perforated or bleeding ulcer
5330	53329	Acute peptic ulcer	Perforated or bleeding ulcer
5334	53369	Chronic peptic ulcer	Perforated or bleeding ulcer
5400	54019	Ruptered appendix	Ruptured appnedix
5900	59019	Acute or chronic pyelonephritis	Kidney infections
5908	59089	Other unspecified pyelonephritis	Kidney infections
681	68299	Cellulitis and abscess	Cellulitis
7854	78549	Gangrene	Gangrene

Source: Jackson et al 1998

Appendix Six

Ambulatory sensitive admissions

ICD-9-CM range		Condition description	ASH catergory
010	01099	Primary tuberculosis infection	Other tuberculosis
011	01199	Pulmonary tuberculosis	Pulmonary tuberculosis
012	01899	Other tuberculosis	Other tuberculosis
033	03399	Whooping cough	Immunization-related/preventable
037	03799	Tetanus	Immunization-related/preventable
045	04599	Polio	Immunization-related/preventable
090	09099	Congenintal syphilis	Congenintal syphilis
137	13799	Late effects of tuberculosis	Other tuberculosis
2501	25039	Ketoacidosis	Diabetes
2510	25109	Hypoglcaemic coma	Diabetes
2512	25129	Hypoglcaemic unspecified	Diabetes
260	26299	Malnutrition	Nutritional deficiencies
2680	26819	Rickets	Nutritional deficiencies
2765	27659	Dehydration	Dehydration
2801	28019	Iron deficiency anemia	Iron deficiency anemia
2808	28089	Iron deficiency anemia	Iron deficiency anemia
2809	28099	Iron deficiency anemia	Iron deficiency anemia
3200	32009	Haemophilus meningitis	Immunization-related/preventable
345	34599	Epilepsy	Epilepsy
382	38299	Suppurative otitis media	ENT & URT infections
390	39199	Acute rheumatic fever	Immunization-related/preventable
4010	40109	Malignant hypertension	Hypertension
4019	40199	Hypertension	Hypertension
40200	40200	Malignant hypertension	Hypertension
40201	40201	Congestive heart failure	Congestive heart failure
40210	40210	Hypertensive heart disease	Hypertension
40211	40211	Congestive heart failure	Congestive heart failure
40290	40290	Hypertension	Hypertension
40291	40291	Congestive heart failure	Congestive heart failure
4111	41119	Internediate coronary disease	Angina
4118	41189	Other coronary disease	Angina
413	41399	Angina pectoris	Angina
428	42899	Congestive heart failure	Congestive heart failure
462	46299	Acute pharyngitis	ENT & URT infections
463	46399	Acute thonsillitis	ENT & URT infections
465	46599	Acute URTI	ENT & URT infections

4721	47219	Chronic pharyngtitis	ENT & URT infections
481	48199	Pneumococcal pneumonia	Pneumonia
4822	48229	Haemophilus pneumonia	Pneumonia
4823	48239	Streptococcal pneumonia	Pneumonia
4829	48299	Bacterial pneumonia	Pneumonia
483	48399	Pneumonia	Pneumonia
485	48599	Bronchopneumonia	Pneumonia
486	48699	Pneumonia	Pneumonia
491	49199	Chronic bronchitis	CORD
492	49299	Emphysema	CORD
493	49399	Asthma	Asthma
494	49499	Bronchiectasis	CORD
496	49699	Chronic obstructive disease	CORD
5184	51849	Acute pulmonary oedema	Congestive heart failure
521	52199	Diseases of hard tissues of teeth	Dental conditions
522	52999	Diseases of pulp & periapical tissue	Dental conditions
523	52399	Gingival & peridontal disease	Dental conditions
525	52599	Other diseases of teeth	Dental conditions
528	52899	Diseases of oral soft tissues	Dental conditions
5589	55899	Non-infectious gastroenteritis	Gastroenteritis
590	59099	Chronic pyelonephritis	Kidney/urinary infection
5990	59909	Urinary tract infection	Kidney/urinary infection
5999	59999	Urinary tract infection	Kidney/urinary infection
614	61499	Pelvic inflammatory disease	Pelvic inflammatory disease (PID)
681	68199	Cellulitis and abscess of finger and toe	Cellulitis
682	68299	Other cellulitis	Cellulitis
683	68399	Acute lymphadenitis	Cellulitis
686	68699	Other local infections of skin	Cellulitis
7803	78039	Convulsions, febrile and NOS	Epilepsy
7834	78349	Lack of expected development	Failure to thrive

Source: Jackson et al 1998